East Engin. Library

DEC 11 1924

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXVIII. No. 3211.] LONDON, NOVEMBER 26, 1924. [76TH YEAR. PRICE 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephones: 9144 LONDON WALL.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
SULPHATE OF AMMONIA PLANT
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
W. NEILL & SON, LD.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'NEILL, ST, HELENS.' Telephone No. 20.

Berk will Guarantee.
Sulphuric Acid
made from Spent Oxide, for
Sulphate Making
Telephone Ave. 0362. Ask Berk *Telegrams.* Berk, London
F.W. BERK & CO. LTD
1 FENCHURCH AVENUE LONDON E.C.3
WORKS AT STRATFORD, E. & MORRISTON, GLAM.

"TORBAY PAINT"
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
51, Old Hall St., LIVERPOOL.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Telephones: 1956 VICTORIA. 3957 Do.
Telegrams: "GASIFICATION, Sowest, LONDON."
WALTER MOORE & SONS,
GAS COAL & COKE CONTRACTORS,
72, VICTORIA STREET,
LONDON, S.W. 1.

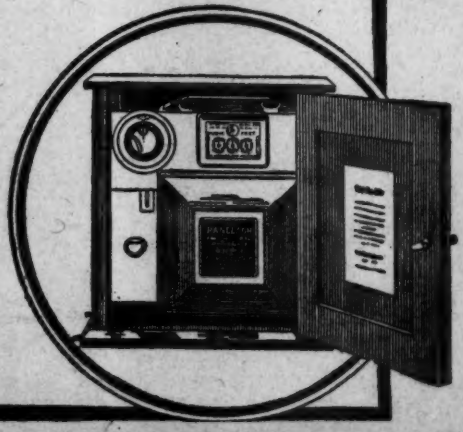
W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on p. iii. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
ASTOR HOUSE, ALDWYCH, LONDON, W.C.2.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

Developing New Business with Hotels.

OUR pamphlet "HOSPITALITY" tells of schemes for equipping Hotels, Boarding Houses, &c., with Gas Fires, each with a
"RANELAGH" HOTEL METER.
This pamphlet reveals a new source of profit which will instantly appeal to all proprietors of Hotels, &c. Send for copies of this interesting circular, which will develop new business in your district.



GEORGE GLOVER & CO., LTD.
Dry Meter Manufacturers and Repairers.
Ranelagh Works, Royal Avenue, Chelsea, London, S.W.3.
Branches: Ranelagh Meter Works, East Park View, LEEDS;
74, Diamond Street, CARDIFF;
City Meter Works, Port Street, MANCHESTER.

Reduce your Maintenance Costs by using **"FERRODOR" ELASTIC PAINT** It is the cheapest because it lasts twice as long as other Paints.
GRIFFITHS BROS. & CO. (LONDON), LTD. BERMONDSEY, LONDON, S.E. 16.

Gasholders

SOME of the oldest and largest Gasholders in the country bear the inscription of the Horseley Bridge & Engineering Company—the sign of quality and strength.

Horseley workmanship and durability are synonymous . . . have been for over 100 years. Their work can be traced back, by means of existing examples of outstanding excellence, to the days of Murdoch and Telford.

Voyage across the seven seas and still the ramifications of the Horseley Company are constantly brought to the notice by reason of the character of design and unvarying strength of their products.

We will gladly submit designs and quotations for GAS-HOLDERS, PURIFIERS, etc.

THE HORSELEY BRIDGE & ENGINEERING COMPANY LTD.
TIPTON · STAFFS.

Grumbly's

PREVENT
Naphthalene Troubles

BY USING AN

OIL SPRAYING PLANT

This apparatus is arranged to give the most efficient quantity of finely divided oil spray in relation to the quantity of gas being used.

The oil is perfectly vaporized, and is carried forward by the gas with a minimum of condensation.

The oil being sprayed by gas, no air or steam enters the mains.

Thorough mixing of the oil with the gas.

PORTABLE PLANTS OR FIXED PLANTS.

Simple in construction. Minimum cost to instal. Cheap to operate and maintain.

A Gas Engineer informs us that since using this Sprayer the number of complaints per month has been reduced from about 850 to 30.

Prices and Particulars on application to—

THE BRYAN DONKIN CO., LTD.

Head Office and Works: CHESTERFIELD.

London Office: 3, Victoria Street, WESTMINSTER, S.W. 1.

MEMBERS OF BRITISH FURNACES Ltd. MAKERS OF GAS FURNACES FOR ALL INDUSTRIAL PURPOSES

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXVIII., No. 3211.] WEDNESDAY, NOVEMBER 26, 1924. [76TH YEAR.

EDITORIAL NOTES.

The New Works at Swansea.

FORTUNATE were the members of the Wales and Monmouthshire Institution of Gas Engineers and Managers in the matter of their meeting last Wednesday. They have for their President Mr. W. H. Johns, the Engineer and Manager of the Swansea Gas Company; and he, through the necessities of the Company, and the co-operation of a Board of Directors blessed with business acumen and vision, had brand new works to submit to their inspection. The constitution of these shows that from the first driven pile to the outlet mains, the Engineer had before him definite aims and objects; and the composite whole leaves no room for criticism, but evokes unalloyed praise such as fell from the President of the Institution of Gas Engineers (Mr. J. Ferguson Bell) and his professional friends, Mr. H. D. Madden, Mr. J. H. Canning, and others. The formal opening of the new works had been arranged to coincide with the meeting of the Institution; and the members had not only the pleasure of receiving the warm-hearted hospitality of the Chairman of the Company (Mr. Ernest H. Leeder) and his colleagues, but the satisfaction of being present on this exceptional day in the history of the Company to join in the expressions of congratulation to their hosts, and of good wishes for the materialization of the most sanguine hopes regarding the part the new works will take in promoting the fortunes of the Company, and service to the people of the borough. With such a big object-lesson in engineering planning and construction, there was no need for other technical items in the programme for the meeting. The descriptive address of the President [*ante*, p. 497] and the inspection of the works afforded all that was required; and the visitors left Swansea with, in their minds, the skilfully co-ordinated features of the works which will not fail to have an influence in many other quarters when extensions, modernization, or new works are called for.

There are sufficient indications in the address to inform us that when Mr. Johns took command at Swansea the works conditions were not what they should have been for a concern whose business was expanding at the rate of that of the Swansea Company. But this was not the fault of the Board; it was their misfortune, for they were in the midst of preparations for new works when ten years or so ago war broke out. The work had to be shelved, and the good intentions postponed. Fine ability, dogged determination, and the harmonizing of practices to conditions that were not most economical and efficient, saw the Company through. But at a price. The main thing was not to allow the business to suffer through plant deficiencies; and therefore the policy was to purchase high-grade coals for the inclined retorts, produce a high-quality coal gas, and use a larger proportion of blue water gas for dilution purposes to make a mixture conforming with the statutory requirements as to calorific value. But no matter how one attempts to ameliorate inefficiency and insufficiency of plant, it is impossible to realize from such conditions the economies that can be secured from modern plant, so designed that every part, with careful ordering and control, is a contributor to the realization of the maximum over-all economy. There were inclined retorts at the Oystermouth Road Works. Such retorts never became fashionable in the gas industry; they had adoption here and there. But they impose close coal-purchasing limitations which is not the case with other types of carbonizing plant. But for Swansea these are matters of the past. The Oystermouth Works have given way to the new ones at Morriston, which, in their provision for the present and the future, show the large faith of the Board and the Engineer in the prospects of the industry. That faith will be fully justified.

It is plain from the Presidential Address that Mr. Johns had a trinal objective in designing the new works. First, suitability for local conditions; secondly, to ensure that every component of the whole would secure the maximum economy and efficiency; and thirdly, design and provision so that much of the plant required for the first section would be available for dealing with the needs of the second section. There is wisdom, when spending on a first section of plant, in looking forward, so that the later outlay in duplicating productive capacity will be comparatively substantially lessened. In such circumstances, present economy, from the financial point of view, may suffer somewhat; but the ultimate economy of it is certain. Again, an engineer has to be scrupulously careful in his decisions as to whether present capital expenditure—for example, on plant for the handling of materials—is justified as against labour costs. So far as the Morriston Works are concerned, the Engineer has complete confidence, and has the ratification of competent colleagues, that his plans will be fully justified by results—and with progressive insistence. In other words, the spending of money to save money will in this case prove a profitable investment.

One feature of the new works which caused the initial expenditure to be higher than it would have been otherwise was the site itself. It would be difficult in the area to find a site with suitable substrata for gas-works. The Morriston site is admirable in respect of situation; its substrata challenged the ingenuity of the Engineer. The defeat of the incompatible substrata in the case of the first section of the plant was brought about by the aid of no less than 853 piles, aggregating a length of 26,300 ft. It was a case for drastic dealing, and not skimping; and the expenditure on piling is an assurance for the future. However, we are not going to rob the Presidential Address of any of its interest by referring to every detail of the plant and the work that was necessitated. For every detail of the work, the President supplies justification, having regard to the present and the future, labour costs, and the requirements of the area of supply. But it may be mentioned that the new works are laid out for an ultimate daily capacity of 12 million c.ft. of coal gas and 6 million c.ft. of water gas. No. 1 retort-house, with a capacity of 3 million c.ft., has been constructed, and provision in coal and coke handling and other plant made for No. 2 section. The retorts are horizontal, 24 in. by 18 in. by 23 ft. long, with all the modern auxiliaries installed. They are operated on the two-shift principle, with four-hour intervals between; the duration of the charges being twelve hours. The selection of horizontal retorts was not made without due consideration of the claims of other types; but the President had reasons for choosing the horizontal system. One is that in the district there is a demand for large coke, resembling in appearance that produced by coke-ovens; and this demand could be best gratified by horizontal retorts. The second is that, by restricting the amount of coke for sale by using a fair proportion in the making of water-gas, a better price can be secured for it to set against the higher make in therms from vertical retorts. That is satisfactory, providing the demand for coke is quantitatively fairly constant, as no doubt it is in Swansea. Furthermore, with a declared calorific value of 450 B.Th.U. it is easy to regulate the mixture of high-grade coal gas and blue water gas, to maintain a steady line in calorific

value and composition. Although there are no figures yet available for publication, the President is confident that the net cost of the gas into the holder will compare favourably with the cost of gas made by other systems. With the plant he has installed, and the system of working two shifts per day with a four-hour interval between, there is no question that labour charges should be low. In connection, however, with the point as to the net cost into the holder, we are without information as to whether Mr. Johns supplies his water gas plant with coke at a lower price than that he is able to command for it outside the works through the restriction of the supply by the friendly co-operation of the water gas plant. A preferential price for coke for water-gas making would, of course, have some effect upon the net cost of the mixed gas into the holder. Another point is that the Drakes charging and discharging machine, and a "G.N." coke transporter, with inclined quenching-bench, have been installed. This method of dealing with coke is growing largely in favour. It would be useful if we heard more about the now fairly long experiences with it—particularly the structural ones, as to the best wearing surface for the bench, the most appropriate inclination, and other details, as well as the effect, with coke from different classes of coals, upon moisture content compared with the ordinary quenching system.

We will not go in greater detail into the description of the new works, and the various considerations it suggests. But we add most sincerely our congratulations to those of others to Mr. Johns upon the thoroughness of his plans for the works present and prospective. He had an opportunity in designing and building on a new site, and not a point has been missed in that opportunity. There is interest throughout; and his expectations as to results we feel certain will be fulfilled. In those will be found the justification for the confidence of his Chairman and Directors.

CO and the M.O.H.

The Medical Officer of Health for Salford (Dr. H. Osborne) is, if we are to believe him, the sole fount of the latest knowledge on the subject of the carbon monoxide content of the flue gases of gas-fires; and apparently his supply of knowledge on the subject is drawn from the work of Mr. Eugene F. Greig, who has been conducting certain researches for the Manchester Air Pollution Committee. Obviously, too, Dr. Osborne is deceiving himself if he thinks that Mr. Greig is the only person who has applied modern methods for the detection of carbon monoxide in the air of rooms. Men who live in a little world of their own sometimes get very circumscribed ideas. Everything that the Salford Medical Officer of Health has written on this subject—written in his annual report, and in letters to the newspapers—assures us that in this particular matter his world is a very little one indeed; the experimental work on which he relies of restricted character; and his deductions altogether opposed to the results of investigations by men whose position in chemical science is far above that of Dr. Osborne or of Mr. Greig.

After the Doctor has brought upon himself criticism in respect of his statements regarding gas-fires, he asserts in a letter that what he said in his annual report on the subject was not primarily an attack on gas-fires, but was intended to draw public attention to the enormous amount of atmospheric pollution contributed by the domestic fire and its serious effect upon health. These intentions were not clearly set forth in the report. As the statements stand, there was plainly an attack upon the gas-fire, which is to-day the most popular and effective method of reducing that atmospheric pollution which has, as the Doctor admits, such a detrimental effect upon health. In the report, too, there was distinct praise of the coal fire as opposed to the gas-fire, though later a smokeless solid fuel is advocated, which, unless it be gas coke, cannot be entirely smokeless. Dr. Osborne must agree when he realizes that low-temperature coke contains from 8 to 10 p.ct. of volatile matter. Let us examine the report to ascertain whether or not the gas-fire was attacked, and whether the coal fire was sufficiently condemned. A newspaper summary of the document tells us that the Doctor said: "The artizan does not take kindly "to the gas-fire, nor to central heating, and who can "blame him?" The ordinary man in the street [it should have been the ordinary man in a room] "prefers the cheerful blaze of the open fire to the dull comfort of the radiator; and science approves his choice." Then he tells of the open fire being an ideal ventilator, and of the health value of visible rays. There is also the assertion that "the gas-fire is but a poor ventilator, compared with the open fire, and, moreover, is a potential danger owing to the high carbon monoxide content of its combustion products." The report, Dr. Osborne says, was not primarily an attack on the gas-fire! Then what was it? His friendly attitude towards the gas-fire is accentuated by this piece of inflation: "It is "true that many people complain of headaches when "occupying a room in which a gas-fire is burning; and for "this reason, after having given the gas-fire a trial, have re-"verted to the open fire with corresponding improvement "in health. It is evident therefore that in the case of the "gas-fire, there is the ever present danger to health, owing "to the high proportion of unburned carbon monoxide in "the flue gases." A gentleman who thinks everybody is wrong excepting himself and Mr. Greig, has strange notions as to what does not constitute an "attack" on the gas-fire. Whether primarily or secondarily, his statements were an attack, and in our opinion a senseless one when facts are considered.

After the criticism of those statements by Mr. F. W. Goodenough at the Manchester Smoke Abatement Conference and by Mr. J. H. Brearley in a letter to the Manchester papers, Dr. Osborne replied through the latter. In one letter, he seems to regard contemptuously tests of gas-fires carried out thirty-one and eighteen years ago, on the ground that since then science has not stood still, and in those days the tests for carbon monoxide in the air were not so sensitive as they are to-day, and therefore minute quantities can now be detected. This is evidence of the little world in which Dr. Osborne lives in respect of this particular matter, and therefore the circumscribed ideas that he possesses. Does he honestly think that in the past thirty-one or eighteen years science has not been applied in the gas industry to this question of heating by gas—to the end that the gas-fire has been vastly improved in respect of combustion and ventilating properties, with complete assurance, where chimney draught is right, that no products of combustion escape into the room where it is used? Does he assume, too, that men of science who study these matters, and whose business it is to be abreast of scientific developments, have not utilized modern knowledge and methods in the examination of the atmosphere of rooms for the detection of carbon monoxide, and that it has been left to the Manchester Air Pollution Committee to enlighten the world? Really Dr. Osborne must give credit to the great gas industry for common sense, and for not being conducted by a set of ignoramuses. Perhaps he will concede that Dr. Leonard Hill, F.R.S., Director of the Department of Applied Physiology at the National Institute of Medical Research, is not likely to be content with the musty records of tests of thirty-one or eighteen years ago with gas-fires of those periods. His tests of gas-fires, conditions of the air of rooms, and the effects of carbon monoxide on the human being have proceeded over many years; and what he has to say on the subject would not be lightly discarded in favour of the views of the Medical Officer of Health for Salford or of Mr. Greig. In his lecture at the Manchester Smoke Abatement Conference, he remarked upon the subject, "because constantly quite erroneous statements are made regarding carbon monoxide poisoning from gas, and the public must understand the truth of the matter." What he presented in this connection will be found towards the end of our report of the lecture which is given in this issue of the "Journal," under the heading of "Effect of Light on Health."

What Dr. Hill says discounts the assumptions of Dr. Osborne, who makes such a large point of the "high" carbon monoxide content of the combustion products of gas-fires. The content is infinitesimal compared with that of the products of combustion of coal and other solid fuel. There is nothing, says Dr. Osborne, to tell us when down draught is taking place when a gas-fire is in use. Chimneys subject to down draught would act precisely the same whether gas-fires or fires fed by coal or "smokeless" fuel were in use, and the results would be worse with the latter. The chimney has not the power of discrimination, and so does not behave worse with a gas-fire in use than with any other fire. His point in this regard is poor, and so is the one that many people have abandoned gas-fires and returned to coal fires. In years gone by we were not surprised at that; but to-day, with the modern types of gas-fire, we can apply practical experience in the heating business as a test of Dr. Osborne's

assertion that people discard gas-fires on account of their bad effects. They can have no effect upon them, any more than the coal or "smokeless" fuel fire if the chimney conditions are right—and even if they are not, the effect would be less. We hope the Doctor will mark this: There has never been a time when gas-fires were fixed in the numbers that they are to-day; there has never been a time when users of gas-fires increased at faster rate the number they already have in use. Will Dr. Osborne apply those substantial facts (which he cannot controvert) to his statement? Will he also tell us why for a quarter of a century in our own offices, the whole of the members of the "JOURNAL" staff have worked in rooms heated only by gas-fires in winter; and we have yet to hear a complaint of the fires from any one of the staff? Science and a large practical experience are strongly opposed to Dr. Osborne.

The Future of Coke.

REFERENCE was made in the editorial columns last week to the progress in favour of gas coke for industrial and domestic use; and yet there is a vast amount of work still to be done to ensure its future. What is wanted in the gas industry is something in the nature of a definite policy in connection with this commodity, for the position prospectively does not appear to us as certain as we should like it to be, gratifying as has been the demand during the past two years or so—in 1923 better if anything than in 1924, taking the country through. For example, during the past ten months, this country has exported 821,037 tons of coke, which is less by 160,678 tons than in the corresponding period of 1923. Then again, a matter of which sight must not be lost is that gas-works coke may have—in fact, we believe has—an incipient competitor in its market.

Let us examine this point. As is well known, coking plants have not had a very rosy time the last two or three years. Owing to the conditions in the iron and steel trades, the markets for the metallurgical variety of coke have not been good, and consequently the coking plants of the country have been far from fully occupied. When such conditions exist, it is only natural that the owners of such plants should explore to ascertain whether or not there is anything that can be done to keep them better employed. Conditions not only favour, but press. At the collieries there is always available a considerable proportion of smalls of all varieties of coal—coking and non-coking. Knowledge has been extending as to the excellent burning cokes that can be produced by the blending of coals of both descriptions. It is obvious that, if a domestic coke can by this means be made instead of metallurgical, the owners of coking plants would not only have two commercial avenues along which to proceed to keep their plants better employed, but some of the low-valued yields of the mines could be utilized by them *in situ* to profitable advantage. At the moment there is a division of view in the mining industry as to whether a low-temperature system or a high-temperature one is the preferable for utilizing grades of coal for which (owing to cost of transport) there is not a good market. But from his recent letter in "The Times," there is no doubt of the opinion of the Chairman of the Coke Association of Great Britain (Lord Gainford) being in favour of high-temperature carbonization; and there is fair confidence that the members of the Association have not overlooked the potentialities of the domestic market for coke, in view of the developments of knowledge, and the campaign for smoke abatement. Already, we are informed, coke suitable for domestic use from ovens has been on offer in the London market, and at a price at which it has no doubt found ready purchasers.

Developments of this kind no one can stop; and we do not know how far they will go. But it is as well to note them, and to apply any feasible action to preserve, and promote as far as possible, the interests of gas-works coke. One step that should certainly be taken is to extend the excellent work of the London Coke Sales Committee to the whole of the country; for that Committee, through Mr. E. W. L. Nicol, their Engineer and Fuel Expert, has done more in a few years to promote new industrial uses of gas coke than the industry accomplished in all the previous years of its existence. Development of this order is essentially the work of a specialist in its applications. He can at any rate lead and advise. In the direction of domestic applications, too, demonstration of utility should be made everywhere—such notable demonstration as the Woodall-Duckham Company made at the Manchester Smoke Abatement Exhibition with a fire burning ordinary gas coke. The incandescence of that fire and its high radiant effect astonished those people who have been brought up in the belief that gas coke cannot burn properly. The fire also attested that gas coke does not produce any smoke whatever to pollute the atmosphere. Gas coke will burn rightly enough when properly prepared and graded for the purpose at the gas-works. Visitors to the Manchester Exhibition tell us that the properties of the gas-coke fire attracted more attention than the neighbouring Coalite fire; it was also noted that the latter could not claim an absolutely clean sheet in respect of the suggested attribute of being altogether non-productive of smoke. When one considers that gas coke only contains round about 2 p.ct. of the original (say) 28 to 35 p.ct. of volatile matter in the coal, and that coke from low-temperature carbonization contains (say) 8 to 10 p.ct., or about one-third to one-quarter of the volatile matter in the original coal, it is easy to see which of the two can best serve the requirements of those who seek an atmosphere unpolluted by smoke.

The gas industry will, no doubt, have to meet competition in the coke market. They have one great advantage; and it is that they produce the coke locally, and (so far as district requirements are concerned) it has not to undergo the cost of, or damage occasioned by, rail transport. Apart from competition, the cheap gas therm in these days depends largely on the secondary products, and the lower the price of the therm the more will gas be required, and the greater will be the quantity of coke produced (unless complete gasification is adopted to countervailing extent). These considerations point to the best effective work being needed to-day in the cause of the preservation and promotion of the interests of the first of the gas industry's secondary products.

Gas-Works and Electricity Generation.

This subject is receiving wider and wider consideration Some time ago attention was called to the proposal of Mr. A. Hugh Seabrook, that gas-works might take up the generation of electricity, and make contribution into the trunk cables to the general supply. In effect, the electricity would be an additional bye-product of coal carbonization; and local generation in this way would be of value in that the distribution losses would be largely reduced compared with bulk generation at a centre, and long-distance transmission. At the Smoke Abatement Conference in Manchester, Mr. E. W. L. Nicol said that the coke at present produced at British gas-works—approximately 8 million tons per annum—is more than sufficient to produce smokelessly and efficiently the whole of the electricity publicly distributed in this country. There is another aspect of the matter. We are learning more and more as to the use of waste-heat boilers in connection with retort-settings and water-gas plants; and the steam resulting from this new economy (apart from that required on the works) might also be utilized in the generation of electricity—to the considerable saving in direct expenditure of fuel for the purpose. As a matter of fact, the omens are that the time will come, as the gospel of coal conservation and co-ordination of its use receives wider acceptance, when the gas industry will be invited to make large and still larger contribution to the supply of electricity for meeting the requirements of the country.

District Engineering Organizations.

The Wales and Monmouthshire Institution of Gas Engineers and Managers at their meeting last week resolved upon an innovation so far as gas organizations are concerned. It was that they should combine with the South Wales Institute of Engineers, and the district branches of the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Institution of Electrical Engineers. This step will enable the members to attend the various meetings and exchange ideas.

Low-Temperature Plant for Dursley.

According to a letter (in our "Correspondence" columns) from Mr. G. C. Dew, relating his experiences with low-temperature coke, the Dursley (Glos.) Gas Light and Coke Company, Ltd., are going to have a low-temperature carbonizing plant erected at their works.

Coal Mines and Electricity.

Mr. T. D. Sparks, the President of the Cumberland Branch of the Association of Mining Electrical Engineers, has made a suggestion to the details of which we think he has not given sufficient consideration—particularly in regard to electricity transmission and water supply for condensation. In his opinion, the coal owners of the country have missed a golden opportunity by allowing public electricity supplies to pass into other hands. The coal owners should have laid themselves out to utilize the low-grade fuel which is plentiful at nearly all mines for the generation of electricity to give bulk supplies to the country by high-pressure overhead transmission lines. Instead of that they actually sell to others the coal required for generating the supply, and then buy electricity from them to work the pits. We wonder Mr. Sparks does not suggest that it is folly for the coal owners to sell coal for any industrial purpose. Why not build factories at the pitheads, and produce most of the things for which manufacturing coal is sold?

Gas Unnecessary.

Then we get a nasty shock. Reading on, we find Mr. Sparks alleging that there is no reason for the existence of gas-works; and we have long been under the impression that they are becoming more and more necessary! Why, he asks, could not the coal at present used at gas-works be utilized at large power stations at the mines to give a national supply of electricity? We should like to tell Mr. Sparks, but the story would take too long. However, he is confident and emphatic on the point. "Gas is not necessary, and electricity could supply the means of power for all requirements." All that is wanted is modern power stations at the pithead, and the thing would be done. We would ask Mr. Sparks to consider one point. The largest London Gas Company are called upon to supply more thermal energy in a year than the whole of the public electricity generating stations in the country. Has Mr. Sparks thought out a scheme for supplying by wire all the thermal energy at present distributed by the whole of the gas undertakings of Great Britain, and the cost of doing it? However, he advances another reason why his proposal should be carried out. It is this—where there is a coking plant operating at or near a mine, there is usually far more gas dealt with than at the local gas-works. A large percentage of this is available for disposal; and it could also be used for his suggested power stations at the pits. We are afraid that Mr. Sparks has not examined the problem with that thoroughness that its importance claims.

Sales of Gas Coke in 1923.

The Chief Inspector of Mines, in his report for 1923, states that, excluding the amount used at gas-works, the quantity of gas coke sold in 1923 in Great Britain was 7,542,867 tons, as compared with 7,737,718 tons in 1922. The value at the works is returned at £9,978,935 and £10,790,947 respectively.

Production at Coking Plants in 1923.

From the same report it is seen that the coking industry improved its position in 1923 compared with the preceding year. It carbonized 19,816,365 tons of coal, as against 13,290,580 tons in 1922—the coke obtained being respectively 13,419,314 tons and 9,035,741 tons. The number of ovens in use in 1923 was 12,643, made up as follows: Beehive, 2961; bye-product, 9074; other kinds, 608.

Coal Exports.

The decline in coal exports is still marked by the October returns. The quantity was 4,932,852 tons, compared with 7,432,868 tons in the same month of 1923, and 6,196,411 tons in 1922. The values were: October, 1924, £5,492,046; 1923, £9,109,867; 1922, £6,992,631. The representation of gas coal in the total exports was 65[illegible],897 tons last month; in October, 1923, 845,792 tons; and in October, 1922, 810,998 tons. The value of the gas coal shipped last month was £686,807; the average price per ton being £1 1s. 1½d. In the ten months of the year, 51,724,948 tons of coal of all sorts were exported, as against 66,905,810 tons in the corresponding period of 1923, and 51,672,984 tons in that of 1922. The contribution of gas coal was: 1924, 7,075,253 tons; 1923, 7,795,952 tons; 1922, 7,536,030 tons.

Gas Coke Shipments.

During October, 99,197 tons of gas coke were shipped. This is a considerable reduction on the same months of 1923 and 1922; the figure being in the former 147,320 tons, and in the latter 114,884 tons. The values were respectively £174,000, £250,280, and £154,111. The value per ton last month averaged £1 15s. 1d. In the nine months 821,037 tons of gas coke were exported, compared with 981,715 tons in the same period of 1923, and 700,642 tons in 1922.

Sulphate of Ammonia.

In October, 25,950 tons of sulphate of ammonia were exported, which was somewhat less than the quantity shipped in October, 1923—viz., 26,587 tons. But so far this year more has been sold abroad than in 1923—the total being for the ten months 226,967 tons, as against 211,593 tons in the corresponding period of 1923.

Tar Products for Abroad.

There was a considerable reduction of exports of tar products last month. Of benzole only 1680 gallons were shipped, as contrasted with 424,599 gallons in October, 1923. This difference is sufficient to account for the drop on the exports for the ten months, which amounted to 1,289,187 gallons, compared with 1,566,140 gallons. Of naphtha, 4274 gallons were sent abroad in October, as compared with 29,456 gallons in October, 1923. The total for the ten months was 162,426 gallons, as against 127,883 gallons in the same period of 1923. Of tar oil, creosote, &c., 4,259,049 gallons were exported in October, as compared with 7,250,372 gallons in October, 1923. In the ten months 36,030,052 gallons were shipped, as against 42,691,654 gallons in the same period of 1923.

Incombustibles in Coal.

The Public Control Committee of the London County Council have under consideration the question as to whether or not the Council should seek powers in the next General Powers Bill to prevent slate, slack, or any incombustible matter being sold to the public as coal, or coal being sold of an inferior quality to that ordered. If such powers were obtained, they would create a little consternation in the coal-mining industry and the retail trade.

Warning Gas Investors.

Communications have been received thanking the "JOURNAL" for the editorial article in last week's issue, under the title of "A Plea for the Defence of Gas Investors." The hope is expressed by correspondents that either the National Gas Council or the Gas Companies' Protection Association will give a lead in this matter to gas companies throughout the country.

Gas Undertakings Returns.

There has now been issued by H.M. Stationery Office (Adastral House, Kingsway, London, W.C. 2, and Branches), at the price of 10s. 6d. net (postage extra), Part II. of the Return relating to all Authorized Gas Undertakings in Great Britain for the year 1923. Part I., dealing with manufacture and supply, was reviewed in the "JOURNAL" for Sept. 10 last. The present part gives statistics in connection with finance and prices; and, pending further notice in our next issue, it may be remarked that the total nominal capital invested in the undertakings dealt with in the returns is £165,210,254 (including loans borrowed by local authorities and since repaid), an increase of £2,281,229 over the amount shown in the previous return. While the receipts of the undertakings on revenue account (£67,576,358) have declined by £3,050,293 from the preceding year's total, their expenditure (£56,593,900) has declined by £2,605,535, and the gross profit has accordingly been decreased by £444,758.

Books Received.—From Messrs. Edward Arnold & Co., of 41 and 43, Maddox Street, London, W. 1, we have received two new publications. One is the third edition of "Fuel," by J. S. S. Brame, F.I.C.—a book well known to our readers. The other is "The Rare Earths," by S. I. Levy, M.A., Ph.D., F.I.C. This contains a section devoted to the incandescent mantle industry. Messrs. Stevens & Sons, Ltd., of 119 and 120, Chancery Lane, E.C. 4, are the publishers of "Statutory Companies and the Companies Clauses Consolidation Acts," written by R. J. Sutcliffe, Barrister-at-Law. This new work will meet a want on the part of those who have to advise or take part in the administration of statutory companies.

PERSONAL.

The note in last week's "JOURNAL" regarding the retirement of Mr. A. R. BURCH, M.Inst.C.E., the General Manager of the Bombay Gas Company, Ltd., was premature. Nothing has yet been definitely decided. But this may be said, that Mr. Burch's return to Bombay is out of the question for some long time—if at all.

After thirty-one years' service, Mr. H. W. FALKNER, Engineer and Manager of the Sandown Gas and Coke Company, Ltd., is retiring at the end of this year. His son, Mr. R. S. FALKNER, has been appointed to succeed him. Mr. R. S. Falkner has held the position of Assistant Manager to the Company for the past six years.

Mr. J. W. SLACK, of Radiation, Ltd., and Mr. WALTER DUNN, Secretary of the Institution of Gas Engineers, have been elected respectively President and Member of Council of the Chartered Institute of Secretaries.

Mr. W. S. STREDWICK sailed by the s.s. "Highland Loch" on the 20th inst. to take up an appointment as an Assistant Engineer with the Primitiva Gas Company of Buenos Aires, Ltd. Mr. Stredwick received his training with the South Metropolitan Gas Company.

Readers will be pleased to learn that Dr. C. W. SALEEBY, whose lectures many of them have enjoyed hearing, is making satisfactory progress. He was recently knocked down by a car, and suffered a double fracture of the leg. It is hoped that he will very shortly be well enough to resume his lecturing arrangements.

Mr. J. H. DAVIES, who was Gas Engineer to the Oswaldtwistle Council for seventeen years, sails for South Africa early in December. The Council, on Nov. 20, approved the preparation of a testimonial to Mr. Davies, expressing regret at his resignation, and appreciating his services "as an official who has devoted so much of his time and thought to the interests of the township." The testimonial mentions that Mr. Davies was appointed Manager of the gas undertaking in 1907. During his seventeen years of office, the works had been modernized, the distribution system overhauled, and the output of gas increased by 120 p.ct. The profits recorded exceeded £80,000, the outstanding debt had been virtually extinguished, and Mr. Davies was leaving a reserve fund of practically £10,000. His business acumen and keen commercial methods had been of inestimable value. During the war, Mr. Davies asked to be released to join the Forces. When this was denied him, he accepted the duties of Clerk to the War Pensions Committee, fulfilling them with honour and credit. The Chairman, Mr. F. Greenwood, J.P., assured Mr. Davies of the best wishes of the Council for the future. He was convinced from his knowledge of Mr. Davies' commercial abilities, his high qualities, his capacity, and his conscientious devotion, that wherever he went he would achieve success.

ELECTRICITY SUPPLY MEMORANDA.

THE flood of words continues over the wiring rules and regulations of the Institution of Electrical Engineers. It is a long time since there has been such excitement regarding any subject of an internal nature. The curious thing is that the critics talk airily and generally respecting them; no one attacks them in detail. Furthermore, no one asserts that, if the rules were carried out to the letter and in the spirit in which they were framed, the standard of electrical equipment would not be commonly of a higher order than it is at present, when its quality extends from the one extreme to the other—much of it to the disgrace and injury of the electricity industry. With all the talk there has been over the rules, we have not seen a single criticism in which anything is said as to how shoddy work (in which the degree of danger is greatest) is to be made a thing of the past. The registration of contractors will not do it, because no one can at present prevent any incompetent and unscrupulous person setting up as an electrical contractor. Nothing short of an obligatory standard of work will ensure a universally higher grade of installation. The difference between the attitude of electricity suppliers and of wiring contractors towards the rules we believe is distinctly marked. "Meteor" of the "Electrical Times" says that there are electricity suppliers who aver that they cannot afford to adopt the rules. Of course, they appreciate that, if wiring is not allowed to sink to the lowest possible level, there are some householders who will not adopt electricity, and so custom will be lost. Those wonderful merits of electricity of which we read in electrical papers and hear of from electrical lips have not sufficient force in them to run large volumes of business homes on the lines of the best standards of equipment. It is suggested by "Meteor" that, if a comparative statement were drawn up of the relative number of fatalities and accidents per annum due to electricity and other public utilities, it would show "what specific importance should be attached to the factor of safety, it would adjust our sense of perspective, it would demonstrate how comparatively immune from risk even bad electric wiring is, it would lead inevitably to the conclusion that many lives are to be saved by converting consumers of gas and oil to the use of electricity." Very well. We will not argue over the last senseless passage. But we ask "Meteor" if he will choose and supply the basis for the comparison. Shall it be founded on the number of consumers or population served, or the number of points of application? We must, of course, have a reliable basis for the comparison in order to arrive at the actual value of the data.

Those Rules.

Voice of the Contractors.

That, however, by the way. We were talking of the attitude of the electricity suppliers towards rules which have been revised so as to secure a higher standard of work to contribute to safety. The "Electrical Contractor" reports that, at a meeting of the Northern Section of the Electrical Contractors' Association it was stated that the Electricity Commissioners are framing new regulations for supply to the public! That is news. Are the rules to be in opposition to those of the Institution of Electrical Engineers? It appears that a Joint Committee have been appointed of which the General Secretary of the Contractors' Association (Mr. Tate) is a member. He considers there should be a standard set of regulations throughout the country. At that meeting there seems to have been satisfaction with the Institution rules; and it was suggested that Mr. Tate should propose the adoption of the rules as suitable for compulsory application throughout the country. Similar views have been expressed at the Manchester and the Sheffield branches of the Association. There is no doubt that the reputable electrical contractors have hitherto suffered considerably through the electricity suppliers turning a blind eye upon the poverty-stricken type of electrical installation, which has allowed C_3 contractors to get much work through undercutting by the aid of poor material and inefficient labour. Nothing but a universal reasonable and good standard of work (made compulsory) will protect the competent contractors from unfair competition. They know this; they are aware, too, that really sound installation of equipment is in the interests of the industry. There may be a trace of self-interest in the motives; but nevertheless those contractors are right who look after permanent interests rather than the immediate gratification of getting a larger number of consumers connected up by the aid of shoddy and defective house wiring. Many electrical engineers are willing to supply with current a type of installation which, if anyone suggested it was good enough for their own homes, would cause indignation to find expression in words more or less suitable to the occasion.

Expensive Street Lighting Conversions.

When conversions of street lighting from gas to electricity are indulged in, it is necessary for the promoters of the change to cut things very fine in order to make out even the shadow of a case in support of their proposal. We often see how the initial expenditure subsequently gradually creeps up through the necessary improvement which is made. Frequently we have seen how small unit lamps are initially employed in order to show a moderate consumption, with the appended declaration that the illumination will be as good as, if not better than, that realized under the gas régime. Before long the ratepayers are disillusioned. To allay discontent, larger unit lamps have to be employed, and the cost has to be increased, but little or nothing is said regarding this—comparison with gas having ceased with the original scheme. After a time, the old lamp standards in the side and secondary streets, it is considered, are not suitable, and so require alteration. Therefore more expense is incurred—again expenditure not taken into account originally. In fact, there seems to be no end to the outlay that can and does take place from the time that conversion is entered upon. Marylebone some years ago spent a large amount of money in transferring street-lighting custom from the Gas Company to the Borough Electricity Undertaking. "Improvements" have taken place from time to time; and now the by-no-means light additional expenditure of £16,070 is to be undertaken to "improve" the lighting of eighteen of the principal thoroughfares. Some 585 old gas standards are to be removed; and taller steel tubular standards, to the number of 227, are to be substituted, at a capital cost of £70 per lamp-post! So the merry game goes on.

Electricity in Industry and Home Life.

A highly interesting address was recently delivered to the North-Western Centre of the Institution of Electrical Engineers by the Chairman (Mr. H. C. Lamb, the Deputy-Chief Engineer of the Manchester Corporation). It is cheering to have any symptom of an improvement in the trade of the country; and Mr. Lamb states that the combined electric power consumption of the 100 largest industrial works using the public supply in Manchester has shown a gradual but continuous rise, month by month, until it is now substantially greater than it was two years ago. He thinks that at the present rate of the industrial demand the output of the public supply works in the chief towns will double itself in four or five years. He points out, too, that while the flat rates for lighting are, on the whole, lower in America than in this country, the rates for power are practically on the same level. It is in the domestic service load Mr. Lamb thinks this country is behind in spite of the fact that there does not appear to be anything in America so favourable to the

consumer as are the two-part tariffs in this country. Yet the number of domestic consumers in British towns is only a small fraction of what it should be. In the Manchester area, for instance, electricity is used in 10,000 dwelling-houses, which is only 5 p.ct. of the whole number, and probably typical of our towns generally. In the most progressive towns in America, a supply is given to 80 p.ct., or even more, of the houses; and Mr. Lamb is of opinion that the difference is chiefly due to the greater enterprise shown there. It must not be overlooked, however, that the electrical progress in America is not to any notable degree in the direction of uses for purposes other than lighting. Never for many years have the gas-works in the United States been so busy making large extensions; and almost solely because for heating and cooking purposes—domestic, industrial, and trade—there is an unceasing accretion of demand. This year we have seen several gas men from the States; and from whatever quarter they come (though in some cases interested in both gas and electricity supplies) the same tale is told.

Greater Facilities Required.

However, Mr. Lamb, in his reference to what he terms the greater enterprise in America, says the problem was there solved by the adoption of a deferred payment system for wiring and fittings—financed in some cases by the supply companies themselves, in others by banks working in conjunction with associations of wiring contractors. The tariffs in force in almost all English towns to-day are, he thinks, sufficiently attractive to ensure that practically all new houses of any class are wired for the use of electricity; but it seems impossible to secure the old houses in any great numbers without some scheme of free or assisted wiring. In the same way, he points out, it is the first cost of electrical apparatus which prevents its use by the general public. For example, until a year ago only 100 electric cookers were purchased and installed by consumers on the Manchester mains; whereas in the first year of a public hiring scheme 500 were connected. If (says Mr. Lamb) rapid progress is to be made, it would appear that more apparatus must find its way from the manufacturer to the consumer through the supply authorities. This method inspires confidence, because the consumer knows that untried and untested articles will not be recommended to him, and that, in case of accidents, satisfactory repairs will be carried out at a reasonable cost. He believes that if this service were developed in Manchester to the same degree as in the most advanced towns elsewhere, it would require the whole of the plant now installed at the Barton Power Station to deal with it. That shows a magnificent optimism.

The Unaccepted Challenge.

Mr. L. L. Robinson, of Hackney renown, has conclusively refused the challenge of Mr. Sam Hall (to which reference has been made in the "Memoranda" on previous occasions); and we do not admire (nor will a good many other men) the lame excuse he makes for declining. He says: "Mr. Hall has fired his last shot, and is satisfied that he has got me, because I will not agree to accept his challenge to a laboratory test of an electric *versus* a gas cooker. I will not accept his challenge for the simple reason that such a test, whatever the result, is absolutely valueless as a guide to the comparative value of gas and electricity for cooking in daily use in the average English home for reasons which are as well-known to Mr. Hall as they are to me." Mr. Hall has suggested not a "laboratory" test, but comparative operation which could be reproduced in any home. Had he suggested a "laboratory" test, is electric cooking with all its boasted refinement of action and result afraid of the (in electrical eyes) plebeian gas? What Mr. Robinson is doing is best described in his own words: "I am continuing to offer electric cookers on one month's free trial to any of my consumers for them to try against the gas cookers they are using in their homes under ordinary workaday conditions; the consumer pays for nothing but the electricity, and is free at the end of the month to decide whether to continue the use of the electric cooker or not. Could anything be fairer? The result of such tests in Hackney has been that exactly 95 p.ct. of the cookers sent out are retained and preferred by the consumers to the gas cookers." What Mr. Robinson is doing is not the point in question; what he is asked to substantiate by a public test is that the over-all operation of an electric cooker is cheaper than that of gas. But he will not. We are surprised, after his active beating of a very big and noisy drum.

Ideal Home Exhibition.

At the last Ideal Home Exhibition, the electricity industry was not luxuriantly represented by special exhibits. But we see that the Electrical Development Association intend to make amends at the next Ideal Home display; and there is talk of their putting some drive into it. The "Electrical Review" looks forward to an interesting and instructive section devoted to domestic electricity, which, "while not so big as the display at Wembley, will retain all the essential points which made that section one of the most striking features of the exhibition." Our contemporary also advises that the Association should get into early communication with the builders of the model houses to ensure that the "superior" claims of electricity are not overlooked on the next occasion.

ILLUMINATING ENGINEERING SOCIETY.

The Opening Meeting of the new session was held at the Royal Society of Arts on Tuesday, Nov. 18. Mr. L. Gaster (Hon. Secretary), in his notes on events during the vacation referred to the conference on illuminating engineering held at the British Empire Exhibition in August, an account of which was given in the "Journal" for Aug. 20, p. 649, and the meeting of the Institution of Public Lighting Engineers and Superintendents in Glasgow in September [see "Journal" for Sept. 24, p. 931]. The work of the Institution, said Mr. Gaster, would be helpful in supplementing the efforts of the Illuminating Engineering Society to promote a better recognition of the importance of good public lighting, and the need for fully-qualified lighting engineers in all important cities.

Progress in Gas Lighting.

It is customary at the opening meeting of the session to review briefly the progress made in lighting during the year. With regard to gas lighting, Mr. J. G. Clark, of the Gas Light and Coke Company, said that throughout the year there had been steady progress along well-understood lines. Perhaps the best way to consider this would be to see what gas did at the British Empire Exhibition at Wembley. Several things of interest in regard to gas lighting occurred there. The Amusements Park, for instance, was illuminated by incandescent gas lamps, and it had been generally agreed that the installation was a complete success. Increased interest was being taken in distance control of gas lighting; and it was likely that this method of regulating gas burners would become more popular. There was also the extended use of silica ware. This remarkable material had two important properties—first, the low coefficient of expansion, which enabled it to withstand great variations of temperature without cracking; and secondly, the high degree of diffusing power, which rendered the light perfectly satisfactory without further shading. There had been introduced an improved form of glass as transparent as any ordinary clear glass, but having a low coefficient of expansion, which allowed of its use at very high temperatures. This glass was used in a new form of Keith high-pressure lamp which was constructed on lines much smaller than those used hitherto. A lamp that yielded 1500 c.p. need be no larger than one yielding only 750 c.p. in the older form of construction. [A description of this lamp was given in the September issue of the "Salesman," p. 169.] He ought also to mention the extended and successful adoption of the cluster burner for street lighting. The principle of this burner enabled a high lighting efficiency to be obtained from gas at ordinary pressures, so that there was practically no limit to the extent of its application. Another outstanding feature of the past year was the increasing popularity of certain well-designed burners which have been placed on the market at a low price. Though these were cheap, they were perfect in regard to the essential features; and he hoped in time they would render the existence of the cheap and shoddy burners impossible. Shoddy burners were extravagant in gas consumption, inefficient in working, poorly made, and in the end proved very expensive appliances to the people who purchased them. The modernizing of school lighting was another item of interest during the past year or so. It was a matter upon which the Society could congratulate themselves, considering the pioneer work done by the members many years ago. It was pleasant to record the increased and increasing interest, on the part of those responsible for the working of industrial concerns, in the use of shades. On the question of propaganda, Mr. Clark mentioned that to his knowledge the members of the gas industry had spared no effort to make popular the principles of good lighting. Not only had this been done through the usual channels, but headmasters of schools had invited occasional lectures to their boys. This form of propaganda was probably as productive of good results as any.

The Committee on Progress in Electric Lamps and Lighting Appliances, of which Mr. S. H. Callow is Chairman, presented a report. In this it is stated that there is a marked tendency towards the use of higher standards of illumination in industry and commerce, indicating that the propaganda for better light is rapidly bearing fruit. Installations designed to give 10 foot-candles are frequently being employed. The report deals with flood lighting, shop-window, theatre, pageant, sign, and outdoor sports lighting; mention being made of an installation carried-out during the year on a football field. This consisted of flood-lighting the ground by gasfilled lamps and angle reflectors; the intensity of light being sufficiently high to enable the game to proceed with ease.

Individual papers were read by Miss Mary Wumm, on "Stage Lighting in Connection with Music," and by Mr. W. G. Raffé, on "The Psychology of Illumination."

Wales and Monmouthshire Junior Gas Association.—Next Saturday (Nov. 29) there will be a meeting at the Aberavon Gas-Works, at 3.15 p.m., for a visit of inspection, by the courtesy of Mr. A. J. Bond, the Engineer and Manager. Afterwards an adjournment will be made for tea, and members will re-assemble in the Municipal Buildings at about 5.45 for a general meeting. The chair will be taken by Mr. B. J. Bell (the President), and Mr. G. H. G. Hughes, of Chepstow, will read a paper on "Distribution."

EFFECT OF LIGHT ON HEALTH.

[A Lecture given at the Manchester Smoke Abatement Conference.]

By LEONARD HILL, M.B., F.R.S., Director of the Department of Applied Physiology at the National Institute of Medical Research.

The exposure of the naked body to open air and sunshine, as practised by the ancient Greeks and Romans, has a most beneficial effect on health. The athletes from whom the great Greek sculptors modelled their statues sported naked in the sun and air. The curative effect of open air and sunshine has been shown in children crippled by tuberculosis of the spine or joints, and in rickety or weakly children. Children with diseased spines or joints are splinted and put at rest, and then exposed naked to the open air and sunshine, whenever the weather allows. They quickly become hardened, and stand exposure just as well as the naked savages who inhabit the cold, bleak, damp country near Cape Horn. Their appetites become good, their muscles hard, and their dispositions happy; and given plenty of good food, they with time become cured of their troubles, and grow up into strong and healthy citizens. The rickety children owe their diseased bones to want of sunlight and fresh air, over-clothed and confined as they are in tenement dwellings, just as much as to a badly chosen diet. Given plenty of exposure to sun and air, they become cured of their rickety bones, even though their diet remains an ill-chosen one. Children kept in a ward under glass do not get so cured, because the glass filters off the healing rays. Animals such as young chickens similarly may grow up strong and big on an ill-chosen diet, if given plenty of open air and sun, while those kept in dark houses on such a diet remain small and weakly, or die off.

For successful open-air treatment, the cooling effect of the air must be given play, and the sun be not too hot. The open air, by cooling the skin, tones up the muscles and nerves, and increasing the heat production of the body deepens the breathing and increases the appetite, and makes healthy the organs of digestion. While the breathing of cool air acts on the nose, throat, and lungs in such a way as to enhance their protective mechanism, and keep off catarrhal infection, the sunshine acts on the skin. While the dark heat rays mostly warm the surface of the skin, the visible rays penetrate to, and locally warm, the blood.

It is, however, the ultra violet rays which act most powerfully on the skin, exciting changes in the deeper cells of the epidermis by which they are absorbed. The ultra violet rays of the sun are those which lie beyond the violet end of the spectrum, invisible, but having great power to produce chemical changes, as instanced by their action on a photographic plate. Clothes, glass, mist, and smoke cut off the ultra violet rays. Much has been made of the sterilizing effect of these rays, but having very small power of penetration through the living substance they act only on the surface film which absorbs them. Thus they sterilize the surface layer of a culture of microbes, but not the layer beneath the surface. One microbe is able to shade another from the shorter ultra violet rays, so small is their penetration. [J. E. Barnard.]

The ultra violet rays are classified into inner, middle, and outer. The inner, longer ultra violet rays penetrate the skin, together with the visible rays of the spectrum, and are absorbed by, and warm, the blood in the skin. The outer, very short ultra violet rays cannot penetrate the horny layers of the outer skin, and so are without action. The middle rays penetrate to, and are absorbed by, the living cells of the outer skin, and produce a reaction which results in flushing of the skin and a greater power of the blood to destroy microbes, signifying a rise in the general resistance to disease. Pealing of the skin and pigmentation follow later. Over-exposure to these rays results in sunburn, with redness, soreness, and actual blistering. A person may be made ill, and the power of the blood to destroy microbes be lowered, by over-exposure.

The growth of all vegetable life is due to the sun's rays, and the sun endows young green vegetables with principles necessary for us. There are in all young green food, and in the milk of cows and eggs of fowls fed on young green food, subtle active principles called vitamins, which are necessary for reproduction of the race, growth, and health. Exposure of a cow to sunlight increases the amount of the growth vitamin in her milk. While stall-fed winter cows have very little, meadow-fed cows have much of it. We want to eat raw salads and young green vegetables lightly cooked, not spoiled by prolonged boiling, and to drink milk and eat butter of meadow-fed cows.

Now smoke pollution of our cities not only robs us of most of the ultra violet rays which should stimulate the skin and keep us strong and healthy, but also prevents the growth of salads in city courts, roofs and window boxes, and diminishes the growth of green vegetables and grass for cows in the suburban gardens and fields. The value of cows falls off round Manchester and surrounding cities, owing to the want of green meadow grass. Smoke pollution enhances the cost of milk, and makes its value in vitamin less. Smoke pollution, also, by making the surroundings so dark, ugly, and dirty, drives people indoors, and away from healthy open-air exercise in the hours of leisure. Moreover, the acid fumes of a smoke fog have an irritative effect on bronchitic and asthmatic people.

It has been shown that when smoke fog and white frost go together, the death rate in the big cities is notably increased. The respiratory disease death rate for Salford has been 3092, against 1867 for England and Wales. Smoke pollution increases the labour of people in washing, cleaning, &c., and by increasing the obstruction to transit which arises from mist, delays, fatigues, and irritates people. In all these ways it impoverishes health. In Southport 176 tons of soot per square mile fell down in the year, against 314 tons in London, 794 in Rochdale, and 885 tons in Newcastle. The soot cuts off the ultra violet rays even more than it darkens the light. We have contrived a simple method of measuring the ultra violet radiation each day, and the results are published in "The Times" weather report. They show that the smoky City of London receives one-half to one-third, or less, of the ultra violet rays which a clean country place receives 30 miles away. The loss of the ultra violet rays is colossal. The method to which I have just referred, and which is being adopted at many stations, enables us to get a measure of this loss, and will permit us to wield a powerful weapon for getting rid of pollution by smoke.

At present we use coal most uneconomically, wasting the greater part of its value and polluting the sky, making gloomy our surroundings, impoverishing our health, and giving ourselves any amount of needless work. New York and the Ruhr district of Germany have reformed and become purified. So must our cities. Let Lancashire lead the way. By distillation of soft coal we get smokeless fuel, such as coke for raising steam or electric power, and for heating purposes in domestic fires, stoves, and boilers; also gas for power, lighting, heating, and cooking. And there is the tar, with its hundred uses, including road-making, the provision of motor fuel, and of many valuable dye-stuffs and chemicals. Lastly, in place of polluting the air with sulphur acids and killing plants, we get an immense supply of ammonium sulphate, a most valuable fertilizer for raising crops.

Electric heaters are clean, easy to use, and free from fumes, but unfortunately to turn the heat of coal into electricity and electricity back into heat is the most wasteful way of using coal —nine-tenths of the energy of the coal being wasted. To ensure the full economic and cheap use of coal, we must distil it; and one of the chief products is gas, which must be utilized. Now, coal gas is a most valuable source of heat for fires and cooking ranges —a smokeless fuel easy and clean to use, and giving us in open gas fires visible rays which penetrate to the blood beneath the outer skin, and warm that. Dark heat from hot water and steam coils warms more the outer surface of the skin, and penetrates less to the blood. Warmed by the rays of an open fire, we can bear an open window in comfort; while with sources of dark heat this is not the case, for the open window lets the hot air escape on which we largely depend for warmth. Thus, using dark heat we come to live in stagnant, stuffy, warm air, which is bad for health and a great cause of catarrh.

Danger arising from the poisonous nature of gas has been magnified both by some who strive to be just and by others who have interests opposed to the use of gas. The poisonous nature of gas requires that it should have given it a smell by which leaks are detected and people warned, that fittings should be good, and that persons should be taught the danger of leaks and fumes from gas rings and cooking stoves and properly to ventilate their houses. Good ventilation by open window has a most beneficial effect on health. Carbon monoxide, the poisonous substance in gas, combines with the red colouring matter of the blood, displacing some of the oxygen which is carried by the red blood from the lungs to the tissues. It has no other poisonous property besides that of robbing the blood of oxygen. How much it robs the blood of oxygen depends on the percentage of carbon monoxide in the air which is breathed in, and how long it is breathed. It takes a considerable time for carbon monoxide to get into the blood, and to get out again when fresh air is breathed. If the percentage is very low, as in the case with the slight leaks from gas pipes or fumes from the appliances when gas is not wholly consumed, the small amount of oxygen displaced by it from the blood is negligible, and does us no harm; for we always, when at rest, have more than enough oxygen in our blood—the surplus being kept ready for any sudden exertion. We know that the health of the employees of gas-works, who are frequently breathing small amounts of gas, is not impaired; and the natural ventilation set up through chinks and crannies by differences in temperature within and without a room is, except in warm weather, so great that, even though windows and doors are closed, small leaks of gas do not make the air poisonous or unhealthy.

A very small percentage of carbon monoxide may escape being burned in gas fires, rings, and stoves; and all fires and stoves ought to be flued. We have found, however, by recent experiments, that even three flueless gas stoves burning in one small room on a cool day, with door and window shut, did not raise the percentage of carbon monoxide in the blood to an appreciable degree. The hot air and sulphur acids arising from such stoves, however, made the head feel stuffy, through causing the membrane of the nose to become congested and swollen. Ample ventilation by open windows should be provided with all stoves, whether gas, coke, or anthracite.

By attention to fittings and education of the public, gas can be safely used, and experience shows that it has been so used for scores of years. The fatalities due to gas poisoning in one year were 2 per million, against 22 from railway accidents, and 100 from street accidents in London. In 1919 there were 992 inquests held on children burned by accidents with open fires. I

have said this about gas, because constantly quite erroneous statements are made regarding carbon monoxide poisoning from gas, and the public must understand the truth of the matter.

The next great health reform is the proper use of coal, the purification of air from smoke, and the setting-up of the habit of taking baths in the open air and sunshine in the summer, and using arc light baths in the winter.

COMBUSTION OF COKE IN ONE STAGE.

A Joint Meeting of the Newcastle Section of the Society of Chemical Industry and the North of England Gas Managers' Association was held at the Armstrong College, Newcastle, last Wednesday evening, Nov. 19. Prof. W. N. HAWORTH presided over a large attendance.

Dr. GEOFFREY WEYMAN, F.I.C., read a paper on "The Combustion of Coke in One Stage," illustrated by lantern slides and experiments.

It was shown by the author in the first place that coal cannot be burnt in one stage, owing to the fact that decomposition sets in before any ignition takes place. Samples of caked semi-coal were exhibited which had been prepared by passing heated air over coal. In no case was there any sign of carbon dioxide in the air after passing the coal.

The combustion of coke was studied by passing air through a column of coke contained in a vertical silica tube suspended in the air and not protected in any way from the surrounding atmosphere. Ignition having been once obtained by application of external heat, a measured current of air was passed, the external supply of heat cut off, and the fire allowed to adjust itself to the natural conditions. It was experimentally demonstrated that the fire zone was very constricted in depth, owing to the high rate of heat loss to the surroundings. It was not stationary, but moved its position to the point nearest the place where the air current was first coming into contact with the coke. There was also a tendency to preferential combustion. Coke was not homogeneous, but consisted of the residues of many types of coal substance. The more easily burnt portions were removed first, and a greater air velocity was required before the partially-burnt coke could be consumed. It was well known in practice that coke picked from ashes was less easy to burn than fresh coke. There was also the tendency for ash to concentrate on the surface of coke and prevent contact. The movement of the fire zone depended on the directions in which these three factors were operating. For example, the movement of the fire zone was comparatively rapid when the fire was lit at the end of a column of coke opposite to that at which the air current was entering; but once it had gained the position next to the incoming air, it only left this place in search of fresh fuel reluctantly, and with high air velocities the fire zone stayed in such a position until the carbon was completely consumed.

The $CO : CO_2$ ratio was found to vary with the position of the fire zone, and was at its minimum when the conditions were such that the heat generated was dissipated in directions away from residual coke. This was considered to have a bearing on the theory of combustion, and as being evidence favouring strongly the theory that carbon dioxide is the sole primary product of combustion. The $CO : CO_2$ ratio at different velocities was found to vary with the rate of heat loss. As the air velocity increased, so did the rate of combustion; no oxygen being detected in the products. Under these conditions, owing to the increase in the amount of heat which has to be dissipated, the temperature must rise till a fresh thermal equilibrium is reached. The actual temperature of the burning particles was certainly higher than that registered by a pyrometer—a fact which prevented the establishment of definite relations. The determination of the reactivity of coke based upon the $CO : CO_2$ ratio did not appear to be of great use in respect to the suitability of coke for purposes of direct combustion; but the ignition range was found to provide the information required.

The determination of the ignition range of cokes was made in the apparatus described, the method consisting essentially of passing a current of air at a known velocity downwards through a quantity of graded coke in a silica tube. A thermo-couple was placed at the upper surface of the coke where ignition occurs. It was considered essential that the heating required for ignition should be accomplished internally, by preheating the air and allowing the temperature to equalize before the heated air reached the column of coke. The rise of temperature was noted at frequent intervals, as well as the first appearance of carbon dioxide. Owing to the fact that coke is not homogeneous, the ignition was spread over a range of temperature. The ignition ranges of cokes were expressed in the form of curves; and large variations in cokes were noted. When the coke had been prepared from similar coals by the same method, the ignition range was found to vary with the volatile matter and real specific gravity; these properties being, in fact, evidence of the heat treatment to which the coke had been subjected. The ignition range really depended on the combined effect of time and temperature, which caused the carbon to become more and more inactive. It was also shown that the constituents of coal were differently affected by heat treatment, and gave different ignition ranges. Fusain gave the lowest ignition range. Many varieties of coke were dealt with; the one with the lowest ignition range being the "Metro" briquette. When coal was ground before coking, the ignition was more rapid, but did not necessarily start at a lower temperature.

As a logical deduction from the results described it was found that the down-draught system was to be preferred for the direct combustion of coke. Two forms of down-draught domestic fireplaces were described, and evidence of the complete combustion which takes place in such fires given in the form of analyses of the chimney gases at the canopy level, showing the presence of about 18 p.ct. of carbon dioxide. Finally, it was considered that the smoke problem would be entirely solved if the gas industry would devote equal attention to the preparation of suitable coke and suitable apparatus in which to burn it.

Discussion.

The CHAIRMAN said they were indebted to Dr. Weyman for the vast amount of experimental work put before them, and for the clear way in which it had been done.

Mr. G. WALKER asked whether there was any sulphur dioxide in the gas from the fumes.

Mr. DUNFORD SMITH said he would like to say that he had seen the domestic grate described, and could testify to the brilliance of the coke fire as compared with the dullness associated with an ordinary coke fire. Dr. Weyman's fire was in every way attractive and pleasant to sit by, as he knew from experience.

Mr. W. MORDECAI was not quite clear as to whether the ignition range was lowest where the coke was made from finely-pulverized fuel, and whether it was also lower where there was a higher temperature of carbonization It would also be interesting to know the effect of the ash content and of pyrites on the ignition range.

Dr. G. LISHMAN remarked that he was not clear as to the exact meaning of the term "ignition range."

Prof. BRISCOE said that he had been extremely interested in the paper and experiments, as he had always felt that sooner or later someone would devise some method of down draught which might be applied to industrial furnaces. He was interested to know whether it would be practical to keep down the percentage of carbon monoxide without the use of secondary air supply and supplementary combustion. Industrial utilization of the idea would depend upon this point. If it was the case that down draught combustion could be made efficient without secondary air, then the possibilities of the idea would increase.

Mr. F. P. TARRATT pointed out that the experiments appeared to have been made with the same class of coke, but produced in vertical and horizontal retorts respectively. The ash content of the vertical coke was higher than that of the horizontal coke. It seemed deplorable, on the face of it, if the vertical retort was turning out a higher ash content than the horizontal. Still, colliery proprietors were to blame in the ash being there at all. At present, the ash content from Durham coalfields was higher than it had ever been. Though Dr. Weyman gave them as much advice as possible regarding the blending of coals, they were still faced with the bugbear of ash content.

Dr. WEYMAN, replying to the discussion, said that though the coke was prepared from coal from the same colliery, and it was presumed that the ash content would be the same, it was not until they completed the experiments that they found it was not so. The high ash was not at all due to the fact that the plant happened to be a vertical one, but merely because the colliery had that class of coal and sent it on to them. Regarding Dr. Lishman's query, the term "ignition range" was introduced because there was no such thing as a temperature point where coke was concerned. The word inflammation had been used in this connection, but he did not think it a correct term. Ignition range gave a better idea of what happened. With regard to Prof. Briscoe's question about carbon monoxide passing with the down draught, all he could say was that less passed than in the up draught. They did get some passing, but it was very small in quantity, and in practice it disappeared, because under practical conditions there was nearly always a slight leakage of air through the bottom of the furnace or grate, which consumed the carbon monoxide. The latter could be practically eliminated if they could keep the bed of the fire shallow. The pulverization of coal prior to carbonization ensured that ignition was sudden. It did not follow that it was lower in temperature. The higher the temperature of carbonization, and the longer the time, the higher the ignition range. So far as he could say, regarding ash as a catalytic agent, if it did play any such part, it was insignificant. Pyrites would tend to lower the ignition temperature. Sulphur dioxide could be detected in the exit gases; but he had not estimated it quantitatively.

The CHAIRMAN said that any investigation which tended to solve the vexed problem of how to cleanse town and cities was worthy of the highest praise; and he felt sure the outside world would be glad to know that experts like Dr. Weyman and others were working on this problem.

Mr. N. S. COX, Secretary of the North of England Gas Managers' Association, proposed a vote of thanks to the speaker, which was heartily carried.

Installing Services without Excavating.

A profitable and recently developed method of installing service pipes in apartment buildings (obviating breaking flags or excavating), by drilling holes from cellar to curb, has, says the "American Gas Association Monthly," recently been devised by one company. A chipping hammer penetrates the cellar wall, and an air drill then works to a depth of about 10 ft. Where greater depths are required, an extension bar is used. Compressed air is supplied by a portable gasolene-engine driven compressor mounted on a trailer for attaching to a motor truck, thus assuring an air supply when and where wanted. According to one user, this method saves in material and labour an average of $7.85 per service. With a total of 800 services monthly, the company utilizing this system can save approximately $6280 monthly, or $75,360 a year. This is an example of the practically limitless adaptability of compressed air.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

A RED-LETTER DAY AT SWANSEA.

BOTH for the Institution and for the Swansea Gas Light Company last Wednesday was a memorable day; for it had been arranged that the formal opening of the Company's new works at Morriston should coincide with the half-yearly meeting of the members. The result was a day replete with interest and enjoyment to the 150 members and guests who were privileged to take part in the proceedings. What was to be seen will have been gathered from the Presidential Address of Mr. W. H. Johns (the Engineer and Manager to the Company), while this is supplemented now by an account of what transpired during the day, when many references were made to the new works, which it was declared would prove a monument to Mr. Johns' engineering ability. The Chairman of the Company (Mr. Ernest H. Leeder) was untiring in his efforts to ensure the comfort of the large party, and in these he received during the day the support of his co-Directors—Col. David Lewis, J.P. (the Deputy-Chairman), Major J. M. Pollard, Mr. J. M. Mulholland, and Mr. W. Rufus Lewis, J.P. Mr. George Rowe, J.P., was unavoidably absent. Mr. Johns, of course, had a strenuous day, but he was ably assisted by Mr. Ernest Ablett (Secretary and Assistant Engineer) and various members of the staff. The visitors (outside the Wales Institution) included the Mayor of Swansea (Alderman John Lewis) and various Corporation officials, Mr. J. Ferguson Bell (President of the Institution of Gas Engineers) and Mr. Walter Dunn (Secretary), Mr. E. J. Fottrell (National Gas Council), Mr. W. M. Mason (British Commercial Gas Association), Mr. C. M. D. Belton (Shrewsbury), Mr. C. M. Croft (Wandsworth), Mr. George Evetts (Westminster), Mr. F. G. Gorman (Lower Sydenham), Mr. W. H. Hammond (Eastbourne), Mr. D. H. Helps (Reading), Mr. W. S. Morland (Gloucester), Mr. W. B. Reidie (Bromley-by-Bow), Mr. R. Robertson (Bristol), Mr. H. C. Smith (Tottenham), and representatives of various contracting firms.

BUSINESS MEETING.

The business meeting was held in the Museum of the Royal South Wales Institution, Cambrian Place, Swansea; the chair being occupied at the outset of the proceedings by Mr. W. CLARK JACKSON, of Neath, the outgoing President.

Mr. JACKSON said he wished, before the commencement of the business, to call upon Mr. Leeder, the Chairman of the Swansea Gas Company, who desired to extend a hearty welcome to the members. He was a very busy man, but had found time to come along to do this.

A WELCOME TO SWANSEA.

Mr. ERNEST H. LEEDER remarked that he felt somewhat of an interloper in coming down to attend their meeting; but the President-Elect wished him to do so. Therefore in the absence of the Mayor (who he had hoped would be present, but was unavoidably prevented), he was there to bid the Institution a very hearty welcome to Swansea. On behalf of the Directorate of the Swansea Gas Company, he could assure the visitors that they were very glad to see them assembled in such large numbers, and including so many of the influential heads of the industry. They would in a few minutes be hearing an address by the Company's Engineer and Manager, Mr. Johns, and in this address there would be many details of the new works. He trusted the visit to Swansea would prove both instructive and enjoyable to all who were taking part in it. The ancient borough of Swansea was hospitable, and the people there were glad to see anybody who was interested in their industries.

MINUTES OF THE LAST MEETING

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the last meeting, and they were confirmed.

NEW MEMBERS.

On the proposition of the HON. SECRETARY, seconded by Mr. W. H. JOHNS, the following were elected to the Association: Members: Mr. Frederick George Brookman, Engineer and Manager to the Tenby Gas Consumers' Company; and Mr. Willie Gibbon, Gas Manager of Haverfordwest. Student: Mr. Howard M. E. Leyshon, articled pupil to the Swansea Gas Company.

THE NEW PRESIDENT.

Mr. JACKSON said it now devolved upon him to introduce to them Mr. Johns, as the President for the ensuing year. Mr. Johns came among them five years ago, and very speedily found his way into their hearts as a real staunch friend. He had always been ready to give those of them who desired it information which had proved of great help; and in spite of the busy time he had spent during these five years, he had put several of the members, at any rate, under much obligation on various occasions by the kind way in which he had assisted them in various problems pertaining to their works. Mr. Johns had had a very big job to tackle at Swansea; but he came to Wales with a reputation, and when they saw the new works later on they would, he felt sure, agree that this reputation had been fully maintained, and indeed amplified. He was a man of integrity and real friendly spirit. These two qualities, together with a sound technical and business training, formed a combination which was required in the industry at the present time. As engineers they were sometimes apt to think their sole job was on the engineering side; but there was no doubt that the social element, the "hail-fellow-well-met" spirit, and the capacity to adapt themselves to their surroundings, helped the industry along considerably.

Mr. W. H. JOHNS (who was cordially greeted on taking the chair) said in the first place he must thank the members very much for their warm reception, and Mr. Jackson for his kind words. He did not know whether he deserved all that had been stated, but during his year of office they would have an opportunity of judging how far he did so. Before sitting down, it was his pleasure to propose a hearty vote of thanks to Mr. Jackson for the way in which he had performed the duties of the office during his year as President. They would all remember for a long time to come the very successful meeting at Neath twelve months ago, when Mr. Jackson permitted them to see the new plant which he had successfully put into operation at his works, and to gather much valuable information regarding the latest methods of working with vertical retorts. Mr. Jackson had also, on the same occasion, secured for them the privilege of a visit to the great oil works in the neighbourhood. In addition, there was the highly successful outing to Dowlais, which he believed had been arranged largely through the influence of Mr. Jackson.

Mr. A. J. BOND (Port Talbot) seconded the vote of thanks.

Mr. JACKSON, in acknowledgment, assured the members that anything he had been able to do had been done with a willing heart. At the same time, they all relied very largely upon their worthy Secretary, and he wished to record his appreciation of the services rendered to him by Mr. Thomas and the Council during his year of office.

THE PRESIDENTIAL ADDRESS.

Mr. JOHNS then proceeded to deliver his Presidential Address (dealing mainly with the new Morriston Gas-Works), which will be found on pp. 497-507 of last week's "JOURNAL."

In concluding it, he said he would like particularly to express his thanks to the Directors for the hearty support they had always accorded him. They had given him practically a free hand in regard to his recommendations—a fact which he appreciated very much indeed. He was further blessed with an excellent staff, every member of which had done his best, and their combined efforts and enthusiasm throughout had done much to bring the Morriston Works to a successful issue.

THE PRESIDENT OF THE INSTITUTION OF GAS ENGINEERS.

The HON. SECRETARY said they were privileged in having present with them Mr. J. Ferguson Bell, of Derby, who was President of the Institution of Gas Engineers. He was sure the members would like to hear a few words from him.

Mr. J. FERGUSON BELL remarked that it afforded him the greatest possible pleasure to be present at the meeting, and to testify his appreciation, on behalf of the Institution of Gas Engineers, of the valuable work that the Wales and Monmouthshire District Institution had carried on through a long series of years. They on the Council of the Senior Institution appreciated very much the assistance received from the local representatives. Mr. Jackson had pointed out that Mr. Johns came to Swansea with a good reputation; and after the address he had given that morning, this reputation would be greatly enhanced. He believed Mr. Johns was trained with West's Gas Improvement Company, whose senior Director had just been elected Lord Mayor of Manchester. Mr. Johns had also been connected with two gas companies famous for the cheap price at which they supplied gas. He was Chief Engineer for a time at Sheffield, and he had also been at Bath; so that the Directors at Swansea had acted wisely in selecting him as their Engineer and Manager. He would like to congratulate them on having taken so broad an outlook as the erection of a fresh works on an entirely new site indicated. This large-minded policy he was certain would amply reward them in the future. It was of the utmost importance that a town of the size of Swansea should be adequately supplied with good gas at as reasonable a price as possible; and they could only furnish gas at a reasonable price if they had well-equipped works. It was evident from the address that they would witness at Morriston a number of new departures—not new in the sense that they had never been tried before, but because of their com-

bination to a greater extent perhaps than it would be possible to find in any other works in this country. It was abundantly clear that the whole scheme had been carefully thought out. It bore the imprint of the engineer, and it was an engineer that was wanted when the expenditure of a large sum of money was involved. Glancing over the Board of Trade returns relating to gas undertakings, he found that the increase in the output of gas by them over one year was about ten times the amount supplied by Swansea. There were unfortunately still a number of people who did not realize the magnitude and the importance of the gas industry; he would like to impress upon the citizens of Swansea and other places the great work that these utility undertakings were doing. The Smoke Abatement Exhibition and Conference which had recently taken place in Manchester had drawn renewed attention to the fact that one of the most important reforms needed in this country from the point of view of health was the purification of the atmosphere in industrial centres. More sunlight was required, and the gas industry could give it. In burning raw coal, people sent to waste huge quantities of valuable products; and in this direction alone the gas industry had a great work before it. They had really only started on the problem of the prevention of smoke, but he felt convinced that the day would come when people would be prohibited by Act of Parliament from polluting the atmosphere. He had recently been on the Continent, where he was surprised to find, in industrial centres, how bright the atmosphere was. This was because in many cases the authorities would not allow to be used fuel which produced smoke. He felt an added pleasure in being at that meeting, because Mr. Johns came from the Midlands. He had proved his efficiency at Swansea, and they all wished him many years of happy and successful work there. They were glad to know the Directors had given him their full confidence, and were certain that this confidence was not misplaced. He had the greatest pleasure in proposing that the thanks of the meeting be given Mr. Johns for his admirable address.

Mr. H. D. Madden (Cardiff), in seconding the vote, remarked that Mr. Bell had told them Mr. Johns came from the Midlands. Well, they sent him up to the Midlands from London, where he (Mr. Madden) first met him, in his student days. He knew him when he was with West's Gas Improvement Company, so he supposed he might regard himself as the oldest friend of Mr. Johns present that day.

Difficulties Encountered.

They had listened to a fine address, in which Mr. Johns had told them a little of the difficulties encountered. He had not said much about them, but those who had to erect big works along the shores of the Severn or the Bristol Channel met with difficulties which other people found hard to realize. What happened in this district along the Severn Sea in the past ages no one knew; but very difficult soils were met with underground—old river beds, &c.—and foundation work in a case like this, of course, had to be most carefully thought out. Evidently from what Mr. Johns had revealed to them, he had brought to bear upon his task the highest engineering skill. The tidal rise and fall of the Severn along this coast was 40 ft., and where there were gravel underbeds the water would race for many miles inshore, and then at the turn of the tide race out again. The alluvial soils and deposits were very troublesome, too. Mr. Johns had referred towards the close of his address to the value of gas lighting from the points of view of ventilation and eyesight preservation. The importance of gas in these respects was not always sufficiently stressed, and he was glad that their President had called attention to the matter.

The President, acknowledging the vote of thanks, expressed his gratification at the kind references to his work which had been made by Mr. Bell, a friend of many years' standing. Somehow it had always been his lot to be appointed to a works where there was much to be done. It was the case at Swansea, and it was so also previously at Sheffield, during the strenuous times of the war. He thanked Mr. Madden, too, for his remarks. They had been boys together in London while struggling with their studies. He believed Mr. Madden was successful in winning the biggest prize awarded for "Gas Engineering" in one year, and, stimulated no doubt by this, he (Mr. Johns) had been able to follow this up by winning the prize himself the next year.

Representative on the Institution Council.

Proposed by Mr. H. Barker (Llanelly), and seconded by Mr. H. E. Jenkins (Lydney), the President was appointed to represent the Wales Institution on the Council of the Institution of Gas Engineers for the year commencing in June, 1925.

Special Purposes Section.

Mr. J. H. Canning (Newport) moved the adoption of the fourteenth annual report and statement of accounts of the Special Purposes Section, which he said had carried out its usual duties, to the satisfaction of the members and the benefit of their undertakings and the industry at large. The financial condition was exceedingly good. The Institution of Gas Engineers had recently established an Education Scheme for the junior members, upon whose capabilities the future success of the industry would so largely depend; and in view of the importance of this work, the Special Purposes Section Committee had voted a sum for prizes for successful candidates or premiums in connection with papers submitted by juniors.

Mr. J. E. Kenshole (Merthyr), the Chairman of the Committee, who seconded, stated his opinion that the section was one of the most valuable—if not the most valuable—of the branches of the Institution's work.

The President said the encouragement which the Committee proposed extending to the juniors was certainly a step in the right direction.

The report was adopted.

Combining with other Organizations.

The President said he had next to put to the meeting a proposition that they should combine with the South Wales Institute of Engineers, together with the District Branches of the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Institution of Electrical Engineers. This matter had been brought up at one of their Council meetings, when it was felt that it would be advantageous to link-up with the other organizations named. In this way they would be able to attend the various meetings and so exchange ideas.

Mr. Madden seconded the proposition, and declared that the scheme was really worth while.

The meeting was in unanimous agreement with this view.

The Directors of the Royal South Wales Institution were, on the motion of Mr. E. Ablett (Swansea), seconded by Mr. J. P. Jones (Caerphilly), thanked for granting the use of the Museum for the business gathering.

The place of next meeting was left to the Council to decide.

Luncheon with the Gas Company.

The business concluded, there was an adjournment to the Hotel Metropole, where the large party were the guests of the Swansea Gas Light Company, upon the occasion of the inauguration of the new gas-works at Morriston. Mr. Leeder, who was in the chair, submitted the Loyal Toast.

The Chairman thereafter proposed "The Wales and Monmouthshire District Institution of Gas Engineers and Managers," and, in doing so, remarked that they were extremely fortunate in having with them the Mayor of Swansea, together with a number of gentlemen who represented some of the largest gas-works, and were well known throughout the industry, as well as heads of the various firms of contractors who had assisted in the erection of the new works, and to whom they were greatly obliged for the good work they had done. He had the honour to be on the Council of the Surveyors' Institution, of Westminster, and from experience gained there could fully appreciate the importance members attached to the Institution to which they belonged. One important thing was that such organizations helped to make and cement friendships with brother professionals that were frequently lifelong.

The Gas Industry in its Youth.

They would not all have the same ideas concerning the construction of a gas-works; if they had, there would be nothing left to discuss. But, without being too optimistic, he hoped their opinion of the new works at Morriston would be a favourable one, and that the Company had spent their capital wisely and well. At any rate, the Board were satisfied they had done their best, and they had taken every care to be professionally advised. From the experience he had gained since he joined the Board, he had come to the conclusion that the gas industry, though comparatively an old one, was as yet in its youth. He had been to Wembley, and was much impressed by the Gas Exhibit there. Also he was much astonished to hear, at a luncheon during the World Power Conference, that the gas manufactured in a year would fill a holder 3500 ft. in diameter as high as Mount Everest, or alternately would fill a 10-in. pipe reaching from the earth to the sun, some 93 million miles. The co-operative work which was rendered possible by their Institution had done much to further their common aim to produce gas as cheaply and as scientifically as possible. There was one man in the gas industry for whom he had the greatest admiration, though he had not the pleasure of knowing him in person. This was Mr. Milne Watson, to whom he thought the gas industry owed an undying debt of gratitude for his constant efforts on its behalf in every direction. ["Hear, hear."] He considered the decision of the Institution to visit Swansea that day a most happy one.

Mr. Johns, in reply, remarked that it was only with the aid of chairmen and directors such as he was fortunate enough to have, who fully realized the necessity for meetings such as this, that the industry could hope to progress in the future as it had done in the past. He greatly appreciated the presence that day of the members of his Board, as well as the great assistance they had rendered him during the five years he had been in Swansea. His main idea throughout had been to erect a works which would give them the most economical production of gas, bearing in mind all the local conditions and difficulties that had to be faced.

Swansea and Its Enterprise.

Mr. J. H. Canning submitted "The County Borough of Swansea," which he said was the most important metallurgical centre in this country, if not in the world. It began to develop over 200 years ago, when Cardiff and Newport were mere fishing villages. Swansea's prosperity had been built up by citizens of the type of the Chairman and Directors of the Gas Company, who were determined to see that no other town was ahead of them in the matter of works necessary for the supply of gas. So long as the town possessed such citizens, Swansea would continue to flourish.

The Mayor, responding, said he would like in the first place to offer on behalf of the town sincere congratulations to the Swansea Gas Company on the very far-seeing extension of their activities which they were there to celebrate that day. He supposed it would be difficult to find in Swansea a more competent body of business men than those who comprised the Directorate of this Company; and when they saw the practical outcome of their considered deliberations, they realized what faith such a body of business men must have in the future development of the town. Swansea was a large and extensive borough; in acreage it was one of the largest in the country. It comprised within its area, and within reach of the most varied industrial interests of which any town could boast, a very large amount of undeveloped

land, with possibilities which were probably greater than the most sanguine of them would forecast. Swansea was bound to extend; and the site which the Directors had chosen for this magnificent development of their work was an interesting indication of the direction in which they, as keen business men, thought the future industrial development of Swansea would spread. The Gas Company and the Corporation were in some measure competitors in business; but they were nevertheless sensible of the fact that they were, at the same time, drawn very closely together by their mutual interest in the progress and development of the town. It was on this common ground that they stood that day, and it was from this standpoint that the Corporation rejoiced to see the business capacity, the energy, and the enthusiasm with which the Directors of the Gas Company were preparing for that phenomenal growth of Swansea which they all anticipated.

GOOD SALESMANSHIP ESSENTIAL.

Mr. W. M. MASON, proposing "The Swansea Gas Light Company," emphasized an important point that is apt to be overlooked at the opening of a new works, when, naturally, attention is chiefly directed to the engineering and production side of the business. The point was that the new works were made necessary mainly by the general expansion of business and demand for gas created by good salesmanship, which, as Mr. Mason pointed out, was one essential element in all-round good service. Good service, he said, undoubtedly included the best engineering practice applied to production of gas of uniform quality, supplied at adequate and uniform pressure, at the lowest possible price; but all these excellent, and, in fact, essential, qualities would be insufficient unless backed by up-to-date salesmanship and service. Publicity was needed to "let the people know." Every cog in the wheel of efficiency was essential if the old chariot was to move as it might, and if, in the course of a short decade, the very effective start so admirably made at Morriston was to prove only the beginning of a new and still more prosperous area of usefulness to the community, the employees, and the shareholders.

The CHAIRMAN, in reply, remarked that it must be apparent to the visitors that, in erecting a complete new works, the Directors were confident of the future for gas. Its scientific production ensuring the conservation of coal supplies, its extensive application to domestic and industrial uses, and the part it could play in improving public health, all contributed to the fact that the industry was a very live one. The Swansea Company's make of gas had increased 40 p.ct. in ten years. At the end of the September quarter, they had registered 11,489 ordinary consumers, 16,264 prepayment consumers, 12,071 cookers on permanent hire, and 2996 public lamps. Nearly 1000 new consumers had been added during the past twelve months. These facts justified their optimism for the future. He was satisfied that one of the best methods of bringing home to the public the advantages and economy of gas lighting and heating was by the direct demonstration of gas apparatus, particularly through the medium of local exhibitions.

Col. DAVID LEWIS, J.P., proposed "The Visitors," and expressed, on behalf of the Gas Company, their gratification at the fact that so many prominent members of the gas industry had honoured them with their presence that day.

Mr. J. FERGUSON BELL acknowledged this, and voiced the thanks of the visitors for all the kindness that had been shown them. They hoped, and believed, that the forward policy of the Swansea Gas Company would be abundantly rewarded. The large amount of money that had been expended on the new works could not for some time be remunerative, but the Directors would have the satisfaction of knowing that they had taken steps to comply in the fullest possible manner with their statutory obligations. They were glad to note from the presence of the Mayor that the Corporation and the Company were living in harmony. He himself thought it was reasonable that the electricity supply should be in the hands of one authority, and the gas supply in those of another, so that the ratepayers might have the benefit of fair competition. The visitors hoped that fortune would continue to smile both upon Swansea and upon its Gas Company. [Applause.]

AT THE MORRISTON WORKS.

Motor vehicles were waiting to convey the party, on leaving the hotel, to the new gas-works, where, after the taking of a photographic group which severely taxed the capacity of the camera, the formal ceremony was carried through. Mr. Leeder, standing on the steps, formally declared the works open, and in doing so expressed the sincere wish that the undertaking might continue to enjoy the success which had attended it since it was established 103 years ago, and that it might always be a benefit to the community at large, and to the employees, as well as a remunerative investment to the stockholders. Subsequently he started one of the hydraulic tipplers, and a wagon load of coal was discharged. For the tour of the works, the visitors were provided with copies of a beautiful brochure, containing in varied form the information that Mr. Johns had furnished in his address, together with a large number of photographic reproductions of different parts of the plant.

Here it is only necessary to add that, so far as could be gathered, the visitors found all to praise and nothing to condemn. Mr. Johns was congratulated all round, and there was general recognition of the good work done by the contractors, the names of the principal of whom, as given at the end of the brochure, it is no more than fair should be here reproduced.

DRAKES LIMITED, Halifax.—Retort house, carbonizing plant, and coke screening plant.

Sub-contractors to Messrs. Drakes Limited.

F. C. Construction Co., Ltd., Derby (Designing), Peter Lind & Co., Westminster (Erecting).—Reinforced concrete foundations for carbonizing plant, breaker pit, grabbing pit, coke crane gantry, and coke hoppers.

British Thomson-Houston Company, Ltd., Rugby.—Electric generators.

Bellis & Morcom, Ltd., Birmingham.—Steam engines for electric generators.

Thos. Broadbent & Sons, Huddersfield.—Electric capstans and fairleads.

Geo. Waller & Sons, Ltd., Stroud.—Wagon tipping gear.

PETER LIND & Co., Westminster.—Reinforced concrete foundations for engine house, boiler plant, purifiers, washing and scrubbing plant, and meter house. Tar and liquor well, and elevated water tank.

STOTHERT & PITT, LTD., Bath.—Coal and coke cranes.

ALDRIDGE & RANKEN, LTD., Bath.—"G.N." coke handling machine.

W. C. HOLMES & Co., LTD., Huddersfield.—Condensers, Livesey washer, ammonia and naphthalene rotary scrubbers, tar and liquor separator, sulphate of ammonia plant.

ROBERT DEMPSTER & SON, LTD., Elland.—Purifiers and connections; tar extractor.

BABCOCK & WILCOX, LTD., London.—Boiler plant.

GOODRICH & HAMLYN, LTD.—Boiler furnaces.

SUPERHEATER UNITS, LTD., Swansea.—Steam connections.

J. C. HASTIE, LTD., Swansea.—Lagging for steam connections.

GEO. WALLER & SON, LTD., Stroud.—Engines and exhausters, and compressors.

JOSEPH EVANS & SONS, LTD., Wolverhampton.—Tar and liquor pumps.

COLUMBUS MACHINERY, LTD., London.—Coke separating plant.

HOOPER & WEYMAN, Newcastle.—Sulphate of ammonia neutralizing plant.

RICHARD WHITE & SONS, Widnes.—Railway sidings.

HY. POOLEY & SONS, Birmingham.—Weighing machines.

C. & W. WALKER, LTD., Donnington, Salop.—Gasholder.

WILLEY & Co., LTD., Exeter.—Station governor.

W. PARKINSON & Co., London.—Station meter; safety governor.

WALTER & JOHNS, LTD., Morriston.—Various buildings.

In the retort house there are fourteen beds of ten retorts arranged in two benches. The retorts in one bench are moulded fireclay, manufactured by Messrs. Mobberley & Perry, Ltd., of Stourbridge, and those in the other bench are built of silica segmental blocks made by Messrs. J. G. Stein & Co., Ltd., of Bonnybridge, Scotland. They are fitted with Drakes' self-sealing mouthpieces, with special automatic catches; and the settings are heated by Drakes' patent tubular regenerator furnaces.

Two exhausting sets have been installed for coal gas. They are Messrs. George Waller & Son's patent four-blade type, each of a capacity of 150,000 c.ft. per hour at 60 R.P.M., fitted with horizontal engines working at a steam pressure of 100 lbs. per sq. in. The exhausters are provided with the latest system of forced lubrication, and steam controlling apparatus is fitted to each engine to maintain a constant suction on the inlet with varying volumes of gas. Two sets of duplex horizontal double-acting steam-driven compound gas compressors have also been installed by Messrs. George Waller & Son, each set being capable of dealing with 100,000 c.ft. of gas per hour, and discharging at 20 lbs. pressure per sq. in. when running at 125 R.P.M. at a steam pressure of 100 lbs. per sq. in. These compressors have been installed for the purpose of sending gas from Morriston to the holder at the Oystermouth Road station five miles away, through a 12-in. high-pressure Mannesmann weldless steel main.

In addition to the water-tube condensers, Messrs. W. C. Holmes & Co., of Huddersfield, have supplied a Livesey tar extractor and a patent horizontal rotary brush ammonia washer-scrubber, each capable of dealing with 3 million c.ft. of gas per diem. They have been arranged so that the clean water admitted at the gas outlet end of the system flows by gravity through the plant and thence to the liquor well. By this method, no re-circulation of the liquor or pumping of any kind is required.

In connection with the sulphate plant, the ammonia still is of the Holmes type, while the plate lead saturator is of Messrs. Joseph Taylor's make. It is proposed to transfer the Wilton tar dehydrating plant from Oystermouth Road to Morriston.

A PRESENTATION.

During the serving of tea in a marquee on the works,

Mr. JOHNS said there still remained one of the most interesting functions of the day to be performed. The leading contractors had expressed a wish to present to Mr. Leeder a small token of their regard, and something to commemorate so great an occasion as this was for the Swansea Gas Company. He would call upon Mr. Wilfrid Drake, who was Chairman of the Committee of Contractors who had had this matter in hand.

Mr. J. WILFRID DRAKE remarked that it was a very great pleasure indeed to the contractors to be present to witness the successful opening of the new works. It was their sincere hope that everything would prove satisfactory, and that an extension might have to be put in hand at an early date. [Laughter.] Their relationship with the Gas Company had been a very happy one, and on his own behalf and on that of the other contractors he asked Mr. Leeder to accept an inscribed silver rose bowl.

Mr. LEEDER expressed his hearty thanks for so handsome a gift. He took it as a compliment not only to himself, but to the other members of the Board. As showing the esteem in which the Swansea Gas Company were held, he mentioned that when they had to make an issue of £450,000 it was enormously oversubscribed. With all their outlay, he considered it a wonderful achievement that they should have been able to meet standing charges, pay statutory dividends, and present a reasonable balance-sheet to the stockholders; but he must admit that the price they had had to charge for gas in the past had been higher

than they would have wished. It was now hoped that, with the economy of the new plant, an improvement in this respect might be effected. They had to thank the contractors, who had done their work honestly and well. The Company employed what they considered to be among the best firms in the gas industry.

EDUCATION IN SOUTH WALES.

Mr. MADDEN, proposing a hearty vote of thanks to the Chairman and Directors of the Swansea Gas Company for their hospitality, said they all regarded it as a great privilege to inspect the new works. He went on to mention that the Council of their Institution had been considering the education question, and to each member he would say: "Get in touch with your Secretary regarding the appointment of a whole-time officer for Gas Supply and Gas Engineering." They must educate their own men as well as educate the public, before the gas undertakings could properly fulfil their mission. It was proposed to hold classes at Cardiff, Swansea, and Newport.

Mr. CANNING seconded the vote of thanks, which was passed with acclamation.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Smethwick Gas-Works.

Between fifty and sixty members of the Association paid an interesting and instructive visit to the works of the Smethwick Gas Department on Saturday, Nov. 15. They were welcomed by Alderman G. F. BETTS (the Mayor of Smethwick), Mr. S. W. B. STEPHENS (the Chairman of the Committee), and Mr. E. HARDIKER (the Gas Engineer).

The CHAIRMAN said he had much pleasure in extending a hearty welcome to the visitors, on behalf of the Smethwick Town Council, and the Gas Committee in particular. He hoped their visit would prove of interest. For some time they had been carrying-out extensions and renewals on a large scale. The principal point of interest at the moment was the construction of a tank for the new 3½ million c.ft. holder.

The MAYOR added his welcome to that of the Chairman of the Gas Committee. He had heard it said that the gas industry was dying of old age, but he certainly thought they could prove otherwise. The manufacture of gas in the past forty years had increased 500 fold, which showed that the people were appreciating to the full the advantages of gas. They at Smethwick were doing their best to re-organize the works from top to bottom, and as a result the consumers were feeling the benefit.

Mr. H. CLARK (of Derby), President of the Association, suitably acknowledged the welcome.

The visitors were then conducted round the works; the party being joined by the Town Clerk (Mr. F. Chapman) and Mr. J. Smith (a member of the Gas Committee).

DESCRIPTION OF THE SMETHWICK GAS-WORKS.

The gas-works adjoin the London, Midland, and Scottish Railway main lines, and are also fed by the Birmingham Canal. The growth of the undertaking since its inception has been remarkable:

1882	Total gas made	123,779,000 c.ft.
1890	,, ,, ,,	148,801,000 c.ft.
1901	,, ,, ,,	263,702,000 c.ft.
1910	,, ,, ,,	449,361,000 c.ft.
1920	,, ,, ,,	653,208,000 c.ft.
1924	,, ,, ,,	779,941,000 c.ft.

The consumption is rapidly increasing, and is expected this year to be in the neighbourhood of 850 millions. The district is essentially an industrial one, and approximately 40 p.ct. of the gas last year was used for industrial purposes. A showroom was opened in connection with the Department in August, 1922; and it is interesting to note that since April 1, 1923, orders have been received for no less than 2653 cookers, fires, and other appliances. Consumers number 4221 ordinary and 10,937 prepayment—a total of 15,158. The increased demand for gas has rendered it necessary to spend a considerable sum of money on the extensions of the works during the past three years. A large amount of new plant has been installed, and a scheme for the erection of a spiral-guided holder, of a capacity of 3½ million c.ft., is in progress. The concrete tank for this is now being constructed.

CARBONIZING PLANT.

The carbonizing plant consists of 56 Woodall-Duckham vertical retorts arranged in two benches of seven settings. They have a nominal capacity of 3½ million c.ft. per day on a straight coal gas basis, and 3¾ millions per day under steaming conditions. The settings have recently been entirely reconstructed on improved principles; and the producers are fitted with step-grate furnaces and "Smethwick" coke discharge hopper and water-seal door.

Two waste-heat boilers, of a nominal capacity of 350 gallons per hour each, are installed to utilize the heat contained in the waste gases from the settings. These boilers are of the Woodall-Duckham fire-tube type, and each is fitted with an induced-draught fan driven by a De Laval steam turbine.

NEW GASHOLDER TANK.

The building of the mass concrete tank is being carried out by Messrs. Thomas Vale & Sons, Ltd., of Stourport. The diameter of the tank will be 187 ft. 6 in., and the depth will be 37 ft. 6 in. It is being constructed of mass concrete reinforced with steel bands, with a puddled backing 18 in. thick. The tank is being lined on the interior with 9 in. of brickwork. The present holder capacity is only equal to 1·4 million c.ft., which is totally inadequate, as the maximum day's output is now nearly 3½ millions.

After inspecting the works, the party assembled for tea at the Council House, after which

Mr. H. CLARK proposed a vote of thanks to the Council and the Gas Committee for their hospitality. The visit had been most enjoyable and interesting. Smethwick had evidently spent a good deal on their plant; but this, undoubtedly, had been spent wisely and well. The attention paid to future extension was a sound policy. It gave him much pleasure to propose the vote of thanks, and he would mention Mr. Hardiker, the Engineer. Mr. Hardiker had done excellent work on the Council of the Midland Junior Gas Association, and his ability as an Engineer was evidently appreciated by his Committee.

Mr. J. H. GEE (Birmingham), in seconding the vote of thanks, said it was a privilege to look over a works so thoroughly up-to-date in every respect. It was evident that no stone had been left unturned to obtain efficiency. The citizens could rest assured that they had an excellent gas-works, and were to be congratulated on having a capable Committee.

Mr. J. H. THOMAS (Birmingham) remarked that it gave him great pleasure to support the vote of thanks. He, too, had been struck with the up-to-date way in which everything on the works was carried out.

Mr. C. F. W. RENDLE (Redditch) said a few words in praise of two respected members of the Association—Mr. E. Hardiker (the Engineer) and Mr. G. E. Currier (Works Superintendent). Knowing them as he did, he fully expected what he had seen during the afternoon. It was a pleasure to inspect a works which obviously was the result of harmony between the staff and the Council. It was a tribute to all parties concerned. Efficiency was evidently the keynote of Smethwick enterprise. He realized that their limited storage capacity must be a constant source of worry, and they would no doubt be very glad when the new holder was completed.

Mr. S. W. STEPHENS, in reply, said they were pleased to know that the visit had been enjoyed. Living in the shadow of Murdoch's works, as they did, it was up to them to see to it that they followed on worthily. He regarded the visitors as good critics; and he was gratified to know that they were pleased with the works. Their big question was that of storage capacity. The necessity for increased capacity arose some twenty years ago, so that now it was absolutely essential. He thought the new holder would solve the difficulty. As a community they were overshadowed by Birmingham, and were apt to be forgotten; but he thought it was being realized that they had an identity of their own. They were trying to make this identity positive. When one realized that Smethwick covered less than 2000 acres, the increase in output was remarkable. They were beginning to feel severely the weight of capital charges, and were likely to do so for some time to come; but they were applying their energies to give satisfaction to the consumer, and were making headway in this direction. He was glad to hear the testimony paid to the Engineer.

The MAYOR expressed appreciation of the difficulties which had confronted the Gas Committee, as he was a member of that Committee for some years when they were struggling through the war period. Mr. Hardiker had come along at a most unfortunate time for himself, but very fortunate for them. The concern was getting worn out; but Mr. Hardiker had set to work, and in his efficient manner reported definitely to the Committee what was wanted. Fortunately he had a good business man in his colleague Mr. Stephens; and the Council wisely decided to follow his suggestions. This policy had proved of benefit to the community; and instead of the price of gas going up, as might have been anticipated, it was showing a downward tendency. They were working for efficiency combined with economy, and it was up to them to give of their best in the interests of the consumers.

Mr. HARDIKER said it had given him much pleasure to show the visitors round the works. The fact that so many members had assembled, proved their keenness; and the industry wanted keen men. He was very pleased that steps were to be taken to restore the original gasholder of Murdoch. In acknowledging the kind things that had been said of him, he referred to the loyalty of his staff, without which it would have been impossible for matters to go ahead as they had.

Waste Heat for Tar Dehydration.

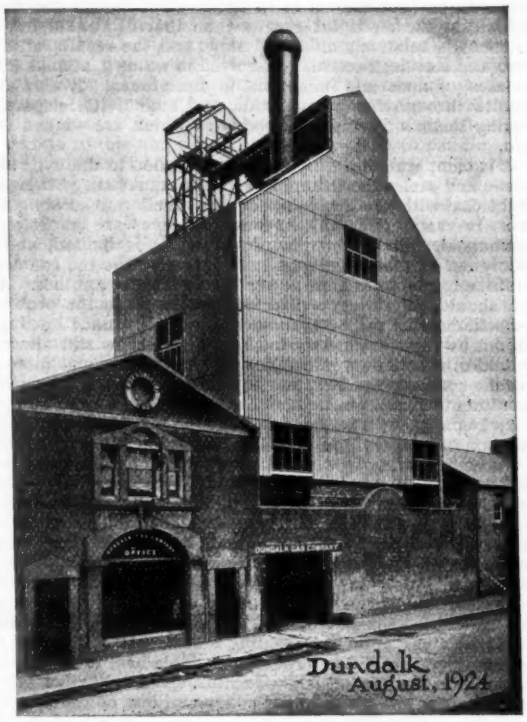
In the October "Bulletin Mensuel" of the Swiss Gas and Water Association Herr O. Mangold described a system in use at St. Margrethen for tar dehydration. The tar is left as long as possible in the pits, and subsequently pumped up to an overhead tank of 25,000 litres [5500 gallons] capacity. Through the tar in this tank runs a steam pipe, which is supplied with superheated steam from the waste-heat plant. By thus heating the crude tar for 48 hours, water separates out, so that the tar can be sold with a guaranteed 2 p.ct. maximum of water. The pipe, which according to the sketch is U-shaped, entering and leaving the cylindrical tank at the top, has no separate outlet for the condensation water which forms in it. This water is therefore carried along with the steam in its passage, and this causes an almost continuous vibration of the steam pipe. To this circumstance the management attribute much of the success of the water separation. It is often found a great advantage to have the tar heated in this way, especially in winter, owing to the ease with which it can be filled into tank wagons or barrels for dispatch.

The next congress of the Royal Sanitary Institute and Health Exhibition will be held at Edinburgh from July 20 to 25, 1925, by invitation of the Magistrates and City Council.

GLOVER-WEST VERTICALS AT DUNDALK.

There has always been a desire to secure for small gas-works with an annual production of 40 million c.ft. downwards, the advantages of continuous vertical retorts. And as the demand is, at the present time, as brisk as ever, the installation at Dundalk is particularly interesting. The problem resolves itself into designing a plant at a low initial cost, capable of being operated by one man per shift, and capable of producing a quantity of gas easily varied from about 200,000 to 50,000 c.ft. per day.

The Dundalk installation, which is erected on the front of the main road, comprises one bench of four Glover-West new model continuous vertical retorts. This retort bench is divided into two separate parts, one consisting of two retorts in one unit, and the other of two retorts sub-divided into two separate units. By this method, the Engineer is able to adjust the plant to suit his immediate supply—that is to say, he can supply the whole of the gas required during full-load periods in winter, by shutting-down one retort he can supply three-quarters of the full load, and by shutting-down a further retort he can supply half the full load in the summer. Furthermore, each retort is so flexible in itself that the quantity of gas made can be varied within wide limits to meet the demand. The installation is capable of producing 240,000 c.ft. of gas per day at a calorific value of 500 B.Th.U, or 5 therms per 1000 c.ft.



Coal is brought from the existing coal stores to the installation in skips which are propelled on an overhead runway. It is dumped into a coal breaker which delivers no piece larger than a 2-in. cube. The coal passes from the breaker into a side-tipping wagon; and when this is filled, the breaker is stopped and the wagon is wheeled to a lift for hoisting to the coal-storage bunkers, which are built into the roof of the retort-house building, and contain a day's supply of coal. The power is supplied by a gas engine, and the same gearing operates the breaker and the lift; suitable belt-shifting gear being provided to put either drive in or out of operation at will.

From the bunkers the coal falls into storage hoppers each of two hours' capacity; there being one hopper to each retort. Thus, the labour of filling the retort consists solely of opening the coal valve once every two hours. The gas is taken off at the top of each retort, and ascends through a pipe into one common collecting main. Each ascension pipe is provided with a special gas valve to enable any one retort to be shut-off from gas-making. The crude gas then travels into a foul main through a pressure governor, and into the various auxiliary apparatus. One producer is provided to two retorts; and the fires are accessible from the floor of the retort house. The coke for heating the retorts is elevated to the level of the producer-charging stage by means of the lift and a bottom-opening wagon.

The retort setting is fitted with a waste-heat boiler worked on the natural draught provided by the chimney of the retort setting. Steam is generated at 80 to 100 lbs. per sq. in., and is superheated to 500° Fahr. It is reduced to 15 to 30 lbs. per sq. in. at the retorts, to which it is fed through special graduated valves.

The retort-house is a steel-framed building strongly braced to the retort bench structure; the covering used being special corrugated asbestos sheeting.

The plant has now been tested and the guarantees have been readily obtained. With a Yorkshire coal (John Brown) the production was 62,135 c.ft. of gas per retort per day, at a calorific value of 508 B.Th.U. (gross).

THE EFFECT OF ATMOSPHERIC IMPURITIES ON BUILDINGS.

By Sir FRANK BAINES, Director of H.M. Office of Works.

[A Lecture, illustrated by lantern slides, delivered at the Smoke Abatement Conference in Manchester, Nov. 4.]

[EXTRACTED.]

I have under my charge numerous buildings (over 6000 in all) of every class and kind. They are situated in every part of England, Scotland, and Wales, and the Department which I have the honour to serve are responsible for the maintenance and upkeep of Royal palaces, public and historic buildings, ancient monuments, museums, post offices, inland-revenue buildings, customs and excise buildings, &c.

The amount involved in the actual maintenance and repair of official buildings is approximately £1,570,000 per annum. This figure includes a provision for heating and lighting and, of course, varies year by year. If the air were as clear and pure in towns as it is in the rural districts, I estimate that at the very least £120,000 per annum could be saved upon the maintenance of official buildings in the charge of my Department, and in addition the rate of depreciation of the structures would be greatly reduced. This computation cannot, of course, be regarded as an exact figure; but after taking carefully into account all the conditions and the appraisement of the serious depreciation of the buildings over the whole area of maintenance and repair work, the saving in actual charges might well be found to be from 30 to 40 p.ct. of present-day costs, if maintenance costs due to impurity in the atmosphere and excessive depreciation of buildings could both be eliminated.

The greasy, sooty impurities in the atmosphere destroy the natural colour of stones or bricks, while the acid impurities cause decay and erosion of surfaces and mouldings, and all carved and distinctive detail. Manchester, as well as London, affords a striking example of the obliterating grime and obscurity resulting from excessive atmospheric impurity. The majority of the buildings are constructed of sandstones, and the sooty deposit becomes absorbed into the surfaces, when the natural quality and colour of the material will never reappear. The colour of the stones used is lost almost immediately under the influence of atmospheric impurity. All buildings, however variable, become dull, dead black in hue, and the vital detail of relief is lost in the all-pervading envelope of soot and the detritus of decay.

The buildings in Whitehall occupied by the Ministry of Health were erected in 1908. The stone has been exposed for approximately 16 years only, and decay has been so rapid that the softer portions have been worn away to a depth of at least $\frac{1}{16}$ in. If a rate of decay as rapid as this had taken place upon all buildings in London constructed of Portland stone since the beginning of the 17th century (when Portland stone came into common use), it is obvious that there would have been very little, if any, of the original detail left for our enjoyment. It is clear that the rate of decay within recent years has been progressively much more rapid, and it is undoubtedly due to the increasing impurity of the London atmosphere.

As the result of the combustion of coal, carbonaceous matter is driven-off mainly as the gases carbon monoxide and dioxide, and as soot containing part of the ash; the sulphur passing off into the atmosphere chiefly as sulphur dioxide. There are thus two distinct impurities passed into the air:

(1) Solid visible impurities, such as soot containing tar and ash.

(2) Invisible gaseous impurities, the principal being dioxides of carbon and sulphur.

Of these two, soot can possibly be eliminated by more perfect methods of combustion, but the gaseous products appear to be inevitable; and no matter how perfect the combustion of coal, no practical means have yet been discovered of filtering them out. The composition and quantity of the soot produced varies with the kind of coal used and the method of burning; factory furnace soot contains more ash and less tar than that from domestic fires, which sometimes holds as much as 40 p.ct. of tar. It is not possible to get absolutely definite data of the amount of soot emitted from flues, but estimates have been made by various experts. One authority states that from boiler flues it amounts to from 0·5 p.ct. to 0·75 p.ct. of the coal burnt. It would appear, however, that it is from the domestic chimney that the greater part of the soot is produced; and authorities estimate that it amounts to as much as 6 p.ct. of the coal consumed.

About 190 million tons of coal are used annually for all purposes in the United Kingdom, of which 35 million tons are burnt in domestic fires.

Applying the above percentage, we have:

6 p.ct. on 35,000,000 from domestic fires =	2,100,000	tons of soot
0·5 p.ct. on 155,000,000 tons from other fires =	775,000	,, ,,
or a total of	2,875,000	,, ,,

The annual coal consumption of London is estimated to be between 17 and 20 million tons per annum, of which (say) 7 million tons is used in domestic fires, and the remainder in factories, &c. The result in this case would be:

6 p.c. on 7,000,000 tons from domestic fires = 420,000 tons of soot
0·5 p.c. on 10,000,000 tons from all other fires = 50,000 " "

or a total of 470,000 " "

It must be admitted that these figures are perhaps open to criticism; they are, however, used with reserve, and only to illustrate the magnitude of the problem. Even should further investigation show that such figures could be reduced by 25 p.ct. or 50 p.ct., there would still be sufficient soot deposited in the atmosphere to cause serious decay and disfigurement to buildings. Passing to the gaseous impurities associated with coal smoke, by far the most important and mischievous are the sulphur gases. Various authorities have made observations in order to calculate the quantity of sulphuric acids formed in the atmosphere in different parts of the country. Without going into details, it may be stated that these vary considerably. To take one concrete instance, the total observed deposit of sulphuric acid per annum over the County of London (117 square miles) was about 8000 tons (Dr. H. O. Des Voux and Dr. J. S. Owens; "The Lancet," Jan. 6, 1912). Before commenting upon the influence of such impurities, it is necessary to draw attention to the effect of fog in the atmosphere. It is known that the quantity of carbon dioxide increases very rapidly during a thick fog; and while 3·5 parts in 10,000 may be regarded as the average amount in country air, observations have determined the fact that it increases as much as three times the normal amount during a fog.

The effect upon buildings of atmospheric impurities involves two aspects:

(1) The disfigurement of the building.
(2) The decay of the material.

The most serious result of impurity in the atmosphere and of the attack of sulphur gases is undoubtedly the erosion and deterioration that takes place on many of the materials used. The action of sulphur acids upon all stones having lime or magnesia in their composition is very rapid and progressive. Probably no stone will better exemplify what takes place than Portland, the stone most used and most relied upon for buildings of importance in London.

When derived from the best quarry beds it is a fine close-grained oolitic limestone. At its best, it deserves its reputation for durability. But this is subject to serious question arising from its variability of structure. This ranges from a structure of clean well-formed oolitic grains to a dense shelly structure, often very hard, and showing on slight weathering a rather rough but not unpleasant surface. Between these two extremes are many gradations with more scattered oons and fossils, with a matrix more or less of a mealy carbonate. On the whole, that which approximates most nearly to a purely oolitic grain, and is free from mealy carbonate, weathers best and has the best appearance. In estimating the causes of decay, it is well to bear this variability of structure in mind.

When sulphuric acid is brought into contact with the stone, either by moisture, or in tarry sooty deposits afterwards saturated with moisture, chemical reaction is set up, in which part of the calcium or magnesium carbonate changes to sulphate, with the evolution of carbon dioxide. The upper and more exposed parts of the stone suffer first, and the flatter and projecting surfaces more than the vertical. The calcium sulphate is much more soluble than the carbonate, and the sulphite even more so; and the streaky effect often to be noted results from water charged with these salts running down and depositing them on otherwise unaffected surfaces.

In addition to direct destruction of the stone surface by the formation of sulphate is to be noted the great alteration of volume due to the conversion of carbonates to crystalline sulphates. Where limestone is attacked and part of the calcium carbonate is replaced by sulphate, the increase of volume is from 1 to 1·7. Where magnesium carbonate is replaced by sulphate, the increase is 1 to 4·2. When, therefore, the acid-bearing water soaks into the stone, and calcium or magnesium sulphate is formed, the physical condition developed may be grave enough to cause exfoliation of the surface. Instances of this kind are very common, in which the presence of crystals of sulphate behind the extruded flake or fragment shows a mechanical bursting away of the face.

While it is not difficult to understand how sulphuric acid and sulphates from the atmosphere and soot attack lime and magnesium stones, the disintegration of bricks and slate is not so easy of explanation. It is indeed the case that corrosion due to sulphuric acid in the atmosphere would result in decay in brickwork; but the large amount of sulphate present in certain instances may be held to be due to absorption of soluble sulphates from liquids trickling down the porous surface of the brick.

It is often noted that where brick and Portland stone are used in conjunction (the latter being attacked by sulphuric acid), the brickwork is in a state of serious decay. This has been noted even where the material used with Portland stone was not porous brick but hard Pennant stone. Where the water from the decaying Portland passed over it, its surface was roughened and eroded with decay. This may be caused by the dissolved sulphate penetrating the surface of the brick or stone, and thus loosening the surface grains by crystallization and expansion. The same result might conceivably happen to slate or granite in similar circumstances, provided incipient natural decay had already slightly opened the cleavage planes of the slate, and if the granite were in a state to admit dissolved sulphate between its surface grains; the action here being mechanical, similar to that of frost. In the case of granite the felspar particles are in course of time attacked directly by acid in the atmosphere, and the decay is the direct result of impurity.

Of the various other causes of decay, the chief and most continuous in action is water, which is a vehicle for destructive elements. Without its softening, solvent, and carrying powers, all other causes of decay would probably cease to be fully effective, or would at least be very much slower in action. Pure water alone can dissolve calcium carbonate, but with carbonic dioxide in solution its action is much more rapid. The action of water with sulphur dioxide is different. Emitted into a perfectly dry atmosphere, this gas would diffuse and be carried away harmlessly. Coming into contact with moisture in the air, it combines and forms sulphurous acid, which in turn oxidizes into sulphuric acid. The two acids in turn form respectively sulphates or sulphites, or remaining as free acid become more or less neutralized, and sooner or later are brought down in rain. The acid-bearing water soaks into every crevice and crack, and into the substance of the material; and it is a fact of experience that a condition of moisture, especially with lack of ventilation, is the medium predisposing to all forms of decay. As to the actual effects of atmospheric acids upon stone, carbonic dioxide is by far the most universal and continuous in its action; but though the quantity diffused in the air is far greater than that of the sulphur acids, its effect is relatively mild and slow, and the results of it more even and less destructive. Dissolved in water it attacks the carbonates of lime and magnesia in limestones. It also attacks granite through the potash, soda, and lime of its felspars, converting them into soluble carbonates which are washed out by rain.

It is comparatively simple to call attention to the evils of coal smoke and atmospheric impurity; but to make suggestions which might deal with the problem, or even ameliorate existing conditions, is vastly difficult. Anthracite stoves are smokeless and economical, but the supply of anthracite is limited, and it is mainly out of the bituminous coal deposits that the country will continue to obtain heating power in one form or another. Attention should certainly be directed first of all to the problem of domestic heating rather than to boiler and furnace heating. It will not be sufficient merely to suggest some new and alternative method of consuming smoke, for it is in the national interest to prevent smoke altogether, and to extract and utilize the valuable constituents of raw coal.

My Department have been responsible for the design and construction of a large number of housing schemes; and the subject of domestic heating by means of steam or hot water from central stations has been carefully considered. It is found, however, that the proposition is not an economical one, and the estimated cost has always proved too heavy to be faced. The capital cost must take account of duplicate plant to provide against breakdown; and the necessary installation and metering required are very costly items. In special circumstances—such, for example, where electricity is generated by means of steam power—it may be possible to use exhaust steam for heating buildings in the vicinity. Ordinarily a vast amount of heating is necessarily wasted in power stations, at least nine-tenths of the available heat in the coal being dissipated in the condensing apparatus. The best efficiency that can be hoped for in the super-power stations of the future will certainly not exceed 25 p.ct., so that three-quarters of the available heat will be wasted. If there are buildings requiring a heat service in the neighbourhood of a high-powered station, the waste heat can be utilized. An arrangement such as this is working very satisfactorily at South Kensington, where the large College buildings and museums are supplied with hot water from the electric generating station. Clearly, however, the conditions there are unusually favourable.

Small central-heating systems for individual houses constitute a more likely proposition; and with coke-fired boilers and hot-water radiators, they could, it is thought, be planned and operated economically. They require, however, skilled attention for maintenance, if good results are to be obtained, and obviously cannot be installed in vast areas of existing accommodation. The most successful means of providing for smoke abatement should operate to cause the least dislocation and disturbance; and any proposal of a revolutionary nature, however desirable it may be in itself, if forced suddenly upon the community may well be foredoomed to failure. Apart from the serious economic considerations, proposals to use gas or electricity universally for heating can never make much headway against mass opinion. From available statistics, the use of gas for domestic heating is increasing, but this is mainly in middle-class accommodation. The small householder still finds its cost prohibitive. From the point of view of national economy, gas heating is sound in principle. About 21 p.ct. of the heat content of coal is effective in heating if it is burned in a good ordinary grate. If it is converted to gas and coke at a gas-works, and the gas burned in the same grate as before, about 16 p.ct. of the heat in the original coal is effective, and a further 10 p.ct. can be obtained by burning the coke, making a total of 26 p.ct. With electric heating, however, only some 8 p.ct. of the heat in the coal consumed in the power house is available to the user. This country is not

well favoured with water power; and unless some more economical method is devised than the present one of generating electrical energy, it is clearly to the gas industry that the nation must look for an economical solution of its present fuel problems. In particular, attention must be given to low-temperature processes of carbonization. Ordinary gas-works coke, with its 1 p.ct. of volatile matter, is not a convenient fuel for domestic use. If, however, raw coal is coked at about 500° to 600° C. instead of the 1000° C. usual in ordinary gas-works practice, the resultant fuel will contain about 10 p.ct. of volatile matter and will burn readily in ordinary grates, producing practically no smoke. The state of affairs consequent upon a successful economic low-temperature treatment of all our coal supplies would be almost Utopian. Not only would this do away almost completely with the smoke nuisance, but millions of gallons of valuable oil products would become available. An industrial civilization, as it develops, appears to demand oil in ever-increasing quantities. Here Great Britain is seriously handicapped, since the Empire owns only 2½ p.ct. of the world's oil deposits, and controls only 5 p.ct. We are, therefore, dependent almost solely for our oil supplies (a serious matter in time of war) on the produce of foreign lands. It is recognized that effective low-temperature treatment of coal will produce some 20 gallons of oil per ton, which in turn may be separated into varying grades of oil from the lightest motor spirit to the heaviest lubricant.

Many systems of production of smokeless fuel by means of low-temperature carbonization have been proposed; and my Department have examined the great majority of them, and experimented with the resultant fuel. It is, however, impossible to regard the problem as solved. Many of the processes seem doomed to commercial failure, owing either to the extremely complicated and costly processes involved, the smallness of the output, or the unsuitability of the resultant fuel. For any smokeless fuel to compete seriously with coal for domestic purposes, it is essential that it must be non-friable and easy to transport, clean to handle, easy to ignite, and cheerful in appearance when burning. The basic principle for commercial success at present would appear to be to market the oil, gas, and other products at such rates as will enable the fuel to be sold at comparatively low prices—*i.e.*, oil should be regarded as the main object of low-temperature treatment, and the fuel looked upon as a bye-product. The solution should not be long delayed; but it may be necessary for legislation to guide development and control and assist production.

Naturally, there will be enormous opposition to any change of drastic character, as the vested interests are powerful. Once, however, smokeless fuel is a commercial proposition, it should be possible to prohibit the burning of raw coal, certainly in particular areas, which could be gradually extended until the whole country was finally embraced. The time is certainly not ripe for legislation of a wholesale character. In the North of England a great deal of domestic cooking is done with a range which requires the lambent flame from bituminous coal. In any case, some better design of cooking range is long overdue, as the pattern at present in general use is particularly inefficient. It should not be beyond the wit of man to design a domestic range to utilize the radiant heat of a smokeless fuel, and advantage would also probably be taken of the vastly increased gas supply to extend gas cooking.

De-tarring Gases by Electrical Precipitation.

Some particulars of the Cottrell electrical precipitation process of cleaning gases, and its application to water gas purification, as furnished by Mr. N. H. Gellert, are contained in the issue of the "American Gas Journal" dated Nov. 1. The process, which was the invention of Dr. F. G. Cottrell, formerly Head of the United States Bureau of Mines, has in the past decade been applied with success to many industries. Its application to combustible gases was more difficult and was developed more slowly than in other industries, because the problems involved were much more complex; but over a period of five years electrical precipitation has successfully removed the dust from the combustible gases of two blast furnaces, and for about a year of a third furnace. Lately it has operated on a somewhat smaller scale for de-tarring water gas. The Cottrell process consists in treating the gas in vertical pipes with a uni-directional high-tension current, causing precipitation of the tar particles. In the vertical tubes is suspended an electrode consisting of a chain or wire held taut by small weights at the bottom. Sometimes rigid electrodes may be used. The current is applied at from 40,000 to 60,000 volts to the gases flowing through the tubes. Since the current is uni-directional —that is, flowing in one direction—the gases which pass up through the tubes at a velocity of 10 ft. per second or less are ionized by the corona discharge from these iron electrodes. By means of this ionization, negative charges of electricity are placed on the small particles of tar and dirt which may exist in the gas, and because the electrodes are negatively charged, the particles are forced to the sides of the pipe, which is grounded. Immediately on reaching the pipe, the particle of tar begins its flow downwards, and drops from the bottom of the pipe to the bottom of the precipitator shell. The precipitator is therefore self-cleaning, and the operation is continuous. As long as the current is on, precipitation takes place. As applied to the removal of tar from water gas, the equipment replaces scrubbers filled with shavings, and handles approximately 5000 c.ft. of gas per minute. The indications are that the cleaner is removing 95 p.ct. of the tar.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The President's Address.

A meeting of the Association was held on Saturday, Nov. 15, at Bradford, to hear the Presidential Address of Mr. E. GILLETT, on the subject of difficulties experienced and overcome at the Thornton Road Gas-Works, Bradford, of which he is the Superintendent.

Prior to the address the party, numbering about seventy, toured the plant, under the guidance of Mr. Gillett, Mr. E. J. Sutcliffe (Deputy Engineer, Bradford Gas Department), Mr. J. Lang, jun. (Works Assistant), Mr. J. W. Roper (Superintendent of the Valley Road Gas-Works), and Mr. G. Waggett (Works Assistant). The installation of Glover-West vertical retorts at Thornton Road, erected some twelve years ago, was the first vertical set at any Bradford works. It consists of two benches of four settings, end to end; each setting being of eight retorts, each of which carbonizes approximately 55 cwt. of coal per 24 hours, making a total for the 64 retorts of 176 tons per 24 hours. Coal is brought by cart and tipped direct into a hopper at the north-western end of the retort house, and from there is led through a breaker, with a by-pass for small coal. A gravity-bucket conveyor of 25 tons per hour capacity carries the coal from the breaker to the overhead hoppers above the settings; these hoppers holding 48 hours' supply of coal—about 350 tons—to obviate any need for week-end work in coal handling. The coke plant comprises two West's chain coke conveyors, delivering the coke *via* a centre pit on to a cross conveyor of the same type, the latter elevating the graded coke into the storage hoppers.

The retort house is of steel framework with 4½-in. brick panelling. It is 184 ft. long by 39¾ ft. wide, and the height to the ridge is 72½ ft. The retorts are 23 ft. long; the top 20 ft. 8 in. being of fireclay, and the lower 2 ft. 4 in. of cast iron. Circulating round the latter the secondary air is heated. In section the retorts are oval, 30 in. by 12 in. at the top, tapering to 35½ in. by 21 in. at the bottom. Each setting is heated by an outside producer at ground-level; and a separate steel chimney, brick-lined, removes the waste gases from each setting.

The coal-handling plant, coke extractors, and conveyors are driven by National gas-engines, mostly in duplicate. The gas is taken-off at the top of each retort into a hydraulic main on the side of each bench, the off-take pipe not being sealed. The gas from each bench is passed through a separate section of plant, each being capable of dealing with 1 million c.ft. per 24 hours. It is first drawn through Clapham water-tube condensers by Waller four-blade exhausters. A spare exhauster of the Root's blower type is provided as a stand-by. The gas is then passed through a "P. and A" tar extractor, and afterwards through a 7-ft. diameter Holmes washer-scrubber for the extraction of cyanogen by means of the British Cyanide Company's process. The process, it was explained, consists in washing the gas in a solution of polysulphides of ammonia; this solution being obtained by dissolving free sulphur in the liquor in the washer. Ammoniacal liquor contains a quantity of ammonium sulphide which dissolves the free sulphur, forming various polysulphides of ammonia. These polysulphides absorb the cyanogen as the gas passes through the washer, with the formation of ammonium sulphocyanide, in which condition it is sold to the British Cyanide Company. The gas is then passed through two tower scrubbers 7½ ft. in diameter and 42 ft. high; at the bottom of the first one being a Walker tar extractor. From here the gas is taken to a Kirkham washer, where the last traces of ammonia are removed, and thence to the purifiers. Each section consists of six boxes 22 ft. by 16 ft. by 4½ ft. deep, water sealed; four being in series and two as catch boxes. Each station meter is of 40,000 c.ft. per hour capacity, and the two holders have a total storage capacity of 890,000 c.ft. A 12-in. diameter high-pressure main connects the Thornton Road Works with a pumping station at the Mill Street Works.

At the subsequent meeting in Listerhills School, Mr. R. N. Webb (Senior Vice-President), of Leeds, occupied the chair, and remarked that they had had a most interesting afternoon inspecting the works about which the President was going to speak. Mr. Webb read letters of apology for unavoidable absence from Mr. C. S. Shapley (Leeds), and Mr. J. Bridge (Elland).

Mr. E. GILLETT then delivered the following

PRESIDENTIAL ADDRESS.

Gentlemen,—In the first place let me express my appreciation and thanks to you for the honour you have done me in appointing me to the Presidency of your Association. I am deeply sensible of the importance and responsibility of the position you have thus conferred upon me; and I shall endeavour as far as I am able to fulfil the duties of President in a fitting manner. We have been in existence as a Junior Association for twenty-one years; and I therefore feel specially honoured in being President during this, the coming-of-age; year.

The address I am about to give will be on some experiences on a vertical retort installation; and I hope it will be both useful and interesting. The carbonizing plant you have just inspected was erected in 1911 and 1912 to replace two retort houses, each of 1 million c.ft. per day capacity, containing direct-fired horizontals. At the time the plant was built, vertical retort carbonization was on its trial, and this installation was one of the largest in the

country. The retorts are set in eight beds of 8's in two benches of four settings, each of a capacity of 1 million c.ft. per bench per day. Each section has its own exhausters, scrubbers, &c., and is a complete works in itself; the gas from each bench being treated separately, and not admixed until it reaches the inlet to the holders.

Gas-making was commenced on the first section on July 4, 1912, and on the second section on Nov. 21, 1912. Starting-up and working a plant of this kind was very interesting; and I thought a few notes on the troubles met with, and how they were overcome, would perhaps be of use to members of this Association. After slowly drying-out and heating-up the settings, gas-making was commenced with a mixture of 50 p.ct. of good-quality screened coal and 50 p.ct. of nuts. At the beginning the temperatures of the retorts were not even throughout their length, and the coke extractors in every case were set alike. As a result we had uneven carbonization and hung-up retorts very early, and also trouble with blocked hydraulic mains. The coal feed to the hung-up retorts was stopped, and the charge allowed to carbonize standing. Rods were pushed through the charges at both top and bottom until the charge fell and the coal in the feeder followed. This caused intermittent working, and the temperature of the gas given off from these retorts was high. This in turn pitched-up the off-take pipes, and caused the temperature of the foul mains to be raised above the dew point. This brought about the deposition of NH_4Cl crystals, which were immediately covered with tar; and these piled-up and blocked the main. We pumped the thin tar from the seal pans at the base of the condensers into the collecting mains, but this had no effect. We got over the trouble by fixing tipplers which intermittently fed liquor from the storage tanks into the end of the foul main. This swilled the deposits into the seal pot at the other end of the main; and this was easily cleared. The temperature of the main was lowered considerably, and the liquor also dissolved most of the NH_4Cl. From the first, steam was blown in very small quantities into the retorts at the discharging end, to prevent back-firing; and when this quantity of steam was increased, some passed over undecomposed, and helped to keep-down the NH_4Cl deposits.

The hanging-up of the charges was overcome by regulating each extractor according to the temperature of the retort, and then re-adjusting the heating sections in the settings so that the top portion of the retort, (say) about 5 ft. 6 in., was a low-temperature carbonizing zone at 700° to 800° C., and the next 14 ft. a high-temperature zone; the working temperature in the flues at the top of this portion being 1300° C. graded down to 1100° C. at the bottom. When we commenced to use more steam, this method was found to be the best; and the alteration we had to make was to raise the lower section temperature about 100° C. After about five weeks' working we had another outbreak of hung-up retorts, so we emptied two of the worst offenders, and found on inspection that they were heavily coated with carbon from top to bottom, and the discharging chambers were lined with a thick coat of matter similar to briquettes. We opened the inspection doors and allowed air to blow through; but the effect on the carbon was small, and we had to chip it off with iron tools specially made for the work. Scurfing was a difficult job until the men got used to it. We had to keep two gangs of three men each scurfing daily, and three men to get hung-up retorts to work. At the present time a hung-up retort is a rare occurrence, and the removal of the carbon from the retorts is done only four times a year. The carbon is easily removed. Two men can scurf and recharge a retort in half-a-day (four hours). The reduction in the number of hung-up retorts and the amount of scurfing required is due to better heat regulation, hourly attention to the pricking-down of the retorts, and keeping the descension pipes free from pitch. These pipes are cleaned thoroughly every other day, and the collecting mains are fished each day.

We had a retort-house governor fitted to each bench (these were of different makes), but our experience with them was bad. Both types made-up very quickly with NH_4Cl and tarry matter. We tried putting live steam into the gas flow, but this pulled down the strength of our liquor seriously, and did not dissolve the deposits. Thin tar had no effect. The only thing we could do was frequently to by-pass them and take the bells and valves out and clean them. This continuous making-up threw pressure on the retorts, and helped to increase the number of hung-up retorts, and also increased the rate of carbon deposit. In the end the governors were put out of action altogether, and the pressure was regulated from the exhauster.

The gas from the retorts is drawn through the condensers, and pushed through the other apparatus. The exhausters are only just large enough for the work they have to do; and we found that the best results were obtained by keeping the temperature of the gas between 65° and 70° Fahr. at the outlet of the condensers. The exhausters, when working unevenly, cause oscillation, which affects both the quality and quantity of the gas made. A pull of half-a-tenth at the top of the retort is sufficient to get the gas away, gives comfortable working to the stokers, and prevents pulling-in of air or furnace gases if there are any cracks in the retorts or ironwork. Pressure on the retorts and oscillation cause the coal to stick in the neck of the feeders, and this gives intermittent working (we call it dumping). The coal, instead of being fed-in steadily, is dumped-in when the stoker comes to prick-down. This hanging, if missed once when pricking-up, probably means that two hours' coal is dropped in at once, and thus most of it does not get its full slow travel through the retort, which results in a smoky discharge. If during this time the lower portion of the charge has carbonized and shrunk, and left the sides of the retort, the coal will surround the carbonized mass and fill the retort solid. We then get a badly hung-up charge, and have to wait until this portion is carbonized before it can be moved. These happenings considerably affect the quality of the gas.

The steam used for steaming the charges has been beneficial in keeping down the carbon; and we have not found any part of the retorts damaged by its use. The scurfing periods are few, and therefore there is less damage by using tools, and the bottom castings or sections are much cooler, the steam carrying the heat from the discharged coke back into the retort. The coke extractor at the bottom of the retort is set to discharge just what the retort will carbonize; this being ascertained by observation. The main drive of the extractor affects the whole four beds. The alterations required to the length of travel of the extractor arms are very few when the heats are kept regular and proper attention is given to the pricking-up at the top of the retort. The feed of coal is very regular and even for the whole 64 retorts. Strict attention is paid to the cleaning of dampers and flues, and care is taken to see that the areas of the openings of the cleaned dampers are not altered, so that the pull remains constant and regular temperatures are thus maintained.

After three years' working, the producers were examined, and it was found that the six courses above the firebars of the producer walls were burned well in. These were cut and renewed, and cracks which had developed in a few of the retort sections were repaired with silica brick. In 1918 I gave to the Association particulars of this repair and of its cost. Since 1915 the retorts have been repaired at three-season intervals; and as the retorts have got older the repairs required have become greater, and rates of wages and the prices of materials have also increased. Each retort was examined carefully and necessary repairs were noted and marked. The cutters-out were then sent into the retorts to work on the sections marked. Some of these retort sections were quite good silica work, put in in 1915, but had to be cut-out to renew the flue floors at the back, which had burnt out. Each section was carefully propped as the work proceeded. Bricklayers were then sent in to re-build the sections. The retorts were re-built of best Derbyshire silica bricks cut approximately to shape on the works, and finally shaped in position so as to give a fine smooth surface and a straight retort without making any offsets or ledges. The brick rings of which the retorts are built-up were made of plain and shaped bricks. The floors of the combustion chambers were made 6 in. thick, of two courses of 3-in. bricks, and supported from the retort section and notched into the main division walls. The regenerator section, which was originally of cast iron, was replaced by hard-burned firebrick when renewal became necessary. These cast-iron sections were in some cases burned badly, owing to gases from the retorts leaking through the joint between the iron and the brick sections. This gas was fired by the secondary air in its travel round the iron portion of the retort, and in some cases burned holes in the castings. These castings were therefore taken out bodily, and replaced with a built-up section in firebrick. In some cases these built-up sections have been in for nine years, and they are still as good as when first put in. The firebrick will stand a higher temperature than the cast iron. This is a great advantage when opening-out a retort, as there is not the same danger of melting-down. The heat transmission to the secondary air is, in my opinion, as good as before. My reason for saying this is that the cast-iron section became coated on the outside with dust and red oxide of iron, which are bad conductors of heat. The bricks were smooth and showed signs of deterioration. Worm heads and shafts wear very well, usually about six years.

Below, figures are given showing gas and tar analyses. The liquor produced ranges between 4° and 5° Twaddell at 60° Fahr.

Gas Analysis. Average of Three Months' Tests.

	P.Ct.
Carbon dioxide	3·7
Oxygen	0·4
Carbon monoxide	8·9
Hydrocarbons	1·9
Methane	27·8
Hydrogen	46·0
Nitrogen	11·3
Sulphur compounds	59·0 grains per 100 c.ft.
Calculated calorific value	502 B.Th.U. per c.ft.

Tar Analysis.

Sp. gr. at 60° Fahr.	1·081
Distillation range:	P.Ct.
Water	3·0
Water-free tar:	P.Ct. by Volume.
0° to 170° C.	4·5
170° to 230° C.	14·6
230° to 270° C.	15·7
270° to 320° C.	10·3
320° to 360° C.	10·7
Pitch above 360° C.	44·2
Carbon bisulphide	0 01
Paraffins in 0° to 140° C. fraction	0·50
Benzene	0·60
Toluene	0·40
Solvent naphtha	1·70
Heavy naphtha	0·70
Loss by washing	2·00
Total crudes	5·90
Naphthalene (by weight)	5·50
Phenols	1·80

Mr. Gillett also gave a working statement of the plant from 1912 to 1923. The only figure in this which was criticized in the subsequent discussion was the cost of repairs and maintenance to retorts, which, from 1915 to 1923, averaged 4·4d. per ton of coal carbonized, but fluctuated considerably between 1918 and 1923.

Discussion.

The CHAIRMAN remarked that, contrary to usual practice, the presidential address was open to discussion. Having personally gone through a little in the way of alteration and improvement of works of this character—indeed, he had had something to do with the works dealt with in the paper—he could only say that the address was highly condensed and could not give any indication of the vast amount of work which Mr. Gillett must have done during the last twelve years to attain the present high efficiency of the plant. Perhaps other members had had trouble with NH_4Cl. If so, he hoped they would contribute something helpful to the discussion.

Mr. J. B. BALMFORTH (Bingley) remarked that, judging from the information which had been given to the meeting, he could easily conceive that the banging of the retorts was probably caused by neglect of rodding the retorts every hour. He would like to know if Mr. Gillett had a definite system of checking the hourly rodding. Was there, for instance, a foreman on night-shift to check it?

Mr. GILLETT replied that the rodding was checked by a foreman, in addition to which there was the check by the calorimeter itself.

In answer to Mr. L. R. COWLEY (Shipley) as to the water content in the tar, Mr. Gillett said the tar from his works was sold on a 4 p.ct. water basis. This content was not exceeded.

Mr. F. FIRTH (Leeds) asked if Mr. Gillett had a circulating tank. He thought that water in tar was due largely to keeping the tar hot.

Mr. GILLETT replied that he had only the ordinary drain pipes into the well. The temperature of the latter was 74° Fahr.

Mr. F. J. JACKSON suggested that it was desirable to remove carbon as systematically as possible, though they found that some retorts got scurfed more than others, and it was not always practicable to keep strictly to an automatic method of scurfing.

Mr. C. H. CHESTER (Wakefield) remarked that in the gas analysis Mr. Gillett got 59·0 grains of sulphur compounds per 100 c.ft. He would like to know the sulphur content after steaming at high pressure—as he presumed was being done when the plant was getting the bigger makes.

Mr. GILLETT said it was about 63 grains, and at one time rose to 70. The coal they used contained a good deal of sulphur.

Mr. BALMFORTH remarked that he was interested in the question of costs. Mr. Gillett had given the cost for repairs at 4·4d. per ton of coal carbonized; and to his mind this was very low. The retorts had been in use for twelve years, and he wondered whether this low figure meant that presently there would have to be a very big jump in repair costs. Did Mr. Gillett feel that his plant was still in good condition? Another point of interest was whether Mr. Gillett had had any experience of using South Yorkshire high-grade coal on this plant. If so, what was the difference in results between the high-grade coal and the comparatively low-grade coal now being used?

Mr. GILLETT said he felt that, despite the low cost in repairs, the plant was in better condition to-day than ever before. They had only had a short experience with high-grade coal.

Mr. H. W. CROWTHER (Bradford) asked if Mr. Gillett had any difficulty with the steaming apparatus.

Mr. GILLETT replied that steaming was largely a matter of judgment. There were interruptions in the steam supply in the retorts, which were found by observation of the colour of the gas and by the sound of the steam when the bottom doors were opened.

Mr. BALMFORTH inquired as to the carbonizing costs per ton of coal.

Mr. GILLETT said he had not furnished this figure; but it could be easily worked out.

Mr. E. J. SUTCLIFFE (Deputy Gas Engineer, Bradford) said it happened that for another purpose he had been looking into this matter, and a fair average for the last few months was 1·8d. per 1000 c.ft., or 24·3d. per ton of coal. This included everything up to the storage of the coke in the hoppers.

Mr. WEBB, bringing the discussion to a close, said they had had a most interesting afternoon. They had discussed the presidential address freely; and he was sure they would all be satisfied with the candid manner in which questions had been answered. Mr. Gillett was a serious-minded and practical worker; and it was always a great pleasure for practical men to ask questions of another practical man, and to get replies in the plain and straightforward way of their President that day. There was just one point on which he would like to comment, and this was in regard to experiences with retort-house governors. His own experience with a certain make of such governor—they had tried it only in one retort house—was not very encouraging. He thought that retort-house governors on a well-worked installation of horizontal retorts were not necessary. If they had a fairly large plant he felt certain that a good steam governor at the exhauster was sufficient. At Leeds they had an exhauster which had been working for 35 years; and they got on the gauge a line practically as straight as the edge of the paper. For better reading, each tenth was extended in size to ⅝ in. This was done because they were gradually working from a 4½-in. seal down to no seal at all. They always had a water-gauge alongside the register, which showed practically a dead straight line.

Mr. L. BATES (Sheffield), moving a vote of thanks to the President for his address, and to him and his colleagues for conducting the party over the plant, said that in the address there were a good many points which were well worthy of close study.

Mr. C. H. CHESTER (Wakefield), seconding, said he was not biased in favour of verticals, but he had been very agreeably surprised with the plant they had seen that day. He was particularly impressed by the practical nature of the address. Mr. Gillett had unquestionably had to put a lot of very hard work into the plant; and he was to be congratulated on his works results and on his excellent address.

The resolution was carried, and Mr. GILLETT briefly responded.

Mr. S. T. S. MUSGROVE (Sheffield) moved a vote of thanks to the Engineer and General Manager of the Bradford Gas Department (Mr. Charles Wood) for allowing the party the privilege of the visit to the plant, and remarked that one of the chief things that struck him during the visit was the remarkable cleanliness and orderliness of the whole works. He had seen few retort houses in better condition.

Mr. W. HEATHCOTE (Halifax, Ex-President of the Association) seconded the proposition, which was carried unanimously.

Mr. E. J. SUTCLIFFE, responding on behalf of Mr. Wood, said he had been asked by the General Manager to convey his apologies for not being present to hear the presidential address of a member of his own department. Mr. Wood's son, said Mr. Sutcliffe, had been in very poor health, and Mr. Wood felt that it was his duty to be with him.

The meeting agreed that the Hon. Secretary (Mr. F. A. C. Pykett, of Halifax) should send to Mr. Wood, on behalf of the Association, the earnest hope of the members for the speedy and complete recovery of Mr. Wood's son to health.

"STALEXMIN."

Patent Jointing, Patching, and Glazing Cement for Gas Retorts.

From the Phœnix Supply Company, of 15, Hosier Lane, London, E.C. 1, we have received particulars of a cement which is the invention of a practical gas engineer (Mr. S. A. M'Minn). It consists of an intimate mixture of certain clays, and contains an ingredient in powder form which readily softens on the application of heat. This preliminary action binds together the clays, and thereafter forms an adhesive protecting skin on the surface of the fireclay or silica retort so treated. The cement is applied in the form of a paste or slurry, and may be rendered or brushed on to the surface when cold, or may be applied with a slice or by other means to cracks or holes in hot patching. "Stalexmin" contains no alkali or any component having a fusing action on the retort material, and therefore cannot injure the parts to which it is applied. Its adhesive and ductile properties when hot are of special value in sealing the pores and cracks in retort walls, and in accommodating itself to expansion and contraction due to changes of temperature. During the preliminary softening on heating there is also a slight expansion of the cement, which is of assistance in establishing a key in the hole or crack to which it is introduced in hot patching; and this holds the plug in position until it has become thoroughly bonded to the surfaces.

The following is the method of application recommended:

For Jointing or Rendering On in the Cold.—The cement is mixed with clean water to the consistency of mortar for application with a trowel, in a similar manner to ordinary fireclay. It is, of course, essential that the retort should be cleaned free from scurf, and that all dust should be swept from the crevices and surfaces. It is more easily and effectively applied in the form of a slurry by means of a brush after all cracks and crevices have been filled with a stiff plastic mixture of the cement, care being taken to press the latter well in before the slurry is applied.

For Hot Patching.—"Stalexmin" is mixed to a plastic mass, plugs of which are moulded to a cone shape of suitable size and pressed well in to the cracks or holes with a slice, in the usual way. The standard quality of "Stalexmin" as supplied has been found suitable for ordinary carbonizing temperatures in the neighbourhood of 900° to 1100° C., but has stood satisfactorily when subjected to temperatures upwards of 1300° C.

Prolonged trials during some few years have been made with satisfactory results at large London gas-works. Apart from its use in retort settings, there is probably a wide field for this cement in coke ovens, boiler settings, kilns, &c., wherever a protective coating is required at temperatures within its range.

Carburetted Water Gas in America.

From figures compiled by the American Gas Association's statistical department, it appears that the total gas produced and purchased for public distribution in the United States last year was 418,000 million c.ft.; while of the gas actually manufactured in the plants of the gas undertakings approximately 74 p.ct. was carburetted water gas, 18 p.ct. coal gas, and about 8 p.ct. oil gas. When compared with the 1922 figures, the coal gas made shows an increase of some 6000 million c.ft., and the carburetted water gas a gain of approximately 8000 millions. The fact that the latter is thus more than holding its position is attributed partly to the increase in some cities in house heating and similar loads, which create a peak that is conveniently dealt with by additional water gas equipment. At the same time, the tendency towards a lower standard of calorific value, and the adoption of increasingly efficient methods, are resulting in the use of less oil for the purpose of carburetting.

Cast Iron Research Association.—In the unavoidable absence of Lord Weir of Eastwood (the President), Mr. H. B. Weeks presided at the third annual meeting of the Association on Nov. 19. The Chairman laid stress on the great progress made during the year, and summarized the main developments, particularly the extended research programme and the establishment of a laboratory. The report and accounts were adopted, these showing a considerable improvement. Sir John Dewrance, K.B.E., was elected President of the Association for the period 1924-26.

A CRITICAL STUDY OF THE PUBLISHED RESULTS OF TESTS OF WATER GAS PLANT.

By DR. M. W. TRAVERS, F.R.S.

(*Concluded from p.* 513.)

32. There are three very weak points in all investigations of water-gas production, the results of which have not as yet been published. These are due to:

(*a*) Failure to measure the amount of air entering the plant.
(*b*) Lack of means of recording loss of carbon.
(*c*) Inaccuracy in estimating the sensible heat of the gases leaving the plant.

If the volume of air entering the plant were measured, it would then be possible to check the quantity of carbon gasified in the blow, which has hitherto only been arrived at as a difference. There is no doubt that the loss of carbon in clinkering, and otherwise, may be large; and with a view to illustrating this point we will again refer to the experiments mentioned in § 9. Some of the more important data relating to these experiments are tabulated below:

—	Report X, Test D.	Report VI. (Mean).
1. Period of test	47·73 hours	47·75 hours
2. Duration of clinkering	3·33 ,,	6·77 ,,
	6·1 p.ct.	14·2 p.ct.
3. Gas per ton of dry coke	57,690 c.ft.	51,280 c.ft.
4. Gas per hour of gas making	27,520 ,,	27,400 ,,
5. Calorific value	296 B.Th.U.	301 B.Th.U.
6. Gas in therms per ton	170·8	154·5
7. Steam to generator, lbs. per 1000 c.ft.	34·6	33·6
8. Carbon in 1000 c.ft. of water gas	14·29	14·52
9. Carbon in equivalent blow gas (?)	15·63	18·80
10. CO_2 : CO in blow gas	4·67 : 5·33	4·88 : 5·12
11. Temperature of water gas at exit	520	365
12. Temperature of blow gas at exit	600	330
13. Depth of fuel bed	5 ft.	6 ft.
14. Composition of water gas—		
CO_2	4·5	4·2
CO	40·7	41·4
CH_4	0·6	0·8
H_2	49·2	49·2
N_2	4·9	4·3
O_2	0·1	0·1
15. Composition of blow gas—		
CO_2	12·1	12·2
CO	13·8	12 8
CH_4	0·3	0·5
H_2	2·4	3·0
N_2	71·3	71·3
O_2	0·1	0·2

33. In these two tests the rate of production of water gas was almost identical—viz., 27,520 and 27,400 c.ft. per hour of gas making, the difference being hardly outside the possible error of measurement. The difference between the compositions of the water gas and blow gas was very small, and every factor influencing the efficiency of gas production points to a higher efficiency in Report VI. Yet the output of water gas in this test was considerably lower than in Test D of Report X. Careful analysis of the results gives no explanation of the apparent discrepancy, which appears to be in some way connected with the fact that in Test D, clinkering occupied only 6·1 p.ct. of the total period of the test, while in Report VI. it occupied 14·2 p.ct. of the period. A water gas generator cannot be kept open for long periods without the combustion of a considerable quantity of fuel taking place in it. This may in some measure account for the difference in the yield of water gas, which has nothing to do with the difference in the depth of the fuel bed.

34. With a view to ascertaining the cause of the apparent discrepancies, we have worked out balance-sheets for the two tests on the lines which we have indicated. The facts recorded in Reports VI. and X. have been accepted as published; and it has only been necessary to make an independent estimate of the loss by radiation and conduction, which is taken as 2 p.ct. of the calorific value of the fuel. This is twice the allowance usually made in gas producer practice. The total loss by radiation has been allocated to the blow and run process in the proportion of 1 : 4, the ratio of the blow to the run period. The balance-sheets refer to a ton of dry coke:

REPORT X., TEST D.

		Blow		Run	
Heat of reaction	A	4,315,950		— 2,011,350	
Sensible heat of:					
Gas	B	— 1,106,650		— 702,350	
Air	C	27,150			
Steam	D		145,950		
Coke	E	4,600	4,150		
Ashes	F	— 33,550		— 30,550	
Radiation, &c.	G	— 60,000		— 240,000	
		4,347,700	— 1,200,200	150,100	— 2,984,250
		P = 3,147,500		Q =	— 2,834,150
		P + Q = 313,350			

REPORT VI. (mean)

	Blow		Run	
Heat of reaction	4,802,700		— 1,802,500	
Sensible heat of:				
Gas	— 954,250		— 421,200	
Air	29,500			
Steam		120,350		
Coke	4,950	3,800		
Ashes	— 41,800		— 32,100	
Radiation, &c.	— 60,000		— 240,000	
	4,837,150	— 1,056,050	124,150	— 2,495,800
	P = 3,781,100		Q =	— 2,371,650
	P + Q = 1,409,450			

35. The value of P + Q for Test D is relatively small, and of the sign which would have been anticipated, since errors in the temperature measurements, and loss of carbon, would tend to make the algebraic sum positive. The error is of the order of 10 p.ct.; and with a view to ascertaining the cause of it, we first adjusted the results on the basis that the temperature measurements were 100° C. too low for both the run and the blow processes. We then obtained the following result:

	C.H.U.
Sensible heat of blow gas 700° C.	1,304,900
,, ,, water gas 620° C.	843,350

Introducing these quantities into the balance-sheet, we obtain the result:

	C.H.U.
Total of quantities under blow (P)	2,949,300
,, ,, ,, run (Q)	2,975,150

We have now run past the balance point. If we suppose that about 5 p.ct. of the carbon which is assumed to be gasified as blow gas is really lost, and that the gases really leave the fuel bed at a temperature about 50° C. hotter than is recorded by the pyrometers, we shall arrive at a true balance.

36. For the series VI. (mean) the value of P + Q is very large, a circumstance which is probably connected with the long clinkering period and the consequent loss of carbon, which is set down as carbon gasified in the blow process. This makes the calculated value of the heat of formation of the blow gas too high, while the fact that the temperature observations are probably too low makes the apparent numerical values of the sensible heats of the gases too small. It must be remembered that the investigation described in the Sixth Report to the Institution of Gas Engineers was carried out on a public utility plant, without interfering with the operating routine, and the authors have never regarded it as covering much more than a general test of the efficiency of the process.

37. Finally, since the water gas produced in Test D approaches in composition to what we have considered to be the standard, we will apply the formula which we developed in the early part of the paper to recalculate the water gas output in this test. The result is as follows:

1. Water gas per ton of coke, dry	57,690 c.ft.
2. Carbon gasified per ton of coke	1,726 lbs.
3. Water gas per 1800 lbs. of carbon	60,130 c.ft.
4. Temperature blow gas + 100° C.	700° C.
5. ,, water gas + 100° C.	620° C.
6. P. from table in § 28.	383,200 C.H.U.
7. Q. from table in § 28.	417,850 C.H.U.
8. Volume of water gas from formula § 28	61,420 c.ft.

The agreement between items 3 and 8 is as close as can be expected.

38. We can now deal with the experiments of which the results are published in Technical Paper No. 6 of the Fuel Research Board. These were carried out with the view of contrasting the Dellwik-Fleischer system of operation, in which a high blast velocity and a shallow fuel bed are used, with the usual method of operating a Humphreys & Glasgow plant, in which the fuel bed is of the order of 6 ft. to 7 ft. As has already been pointed out, more certain information would have been gained if the depth of fuel bed and the blast velocity had been varied independently.

39. It may be pointed out that Tests 8 and 2 of this series may be disregarded, as they were only preliminary runs, in which the plant was tuned up for Test 3. Test 4 is an example of running under standard conditions. We will deal with Tests 3 and 4 only.

40. It must be admitted that the measurement of the temperatures of the gases leaving the generator is a matter of no little difficulty, particularly in the case of the blow gas when the blast period is short. In these circumstances the drop in temperature of the gas as it leaves the generator must be very rapid, and error is likely to arise through radiation from the thermo-junction, if it is not carefully shielded. Though the temperatures in the table above represent the maxima recorded, it is possible that they are actually lower than the actual temperatures of the gases. The measurement of temperature under these conditions is a matter which requires further study. The quantity of primary air given above was in no case the result of direct measurement, and there is no evidence which would enable us to differentiate between the carbon gasified as blow gas, and the carbon consumed while clinkering.

41. It is therefore hardly worth making the laborious calculations involved in the compilation of a balance-sheet. However, as the composition of the water gas in both tests approaches to hat of our standard, we may use the formula to calculate the quantity of water gas which the experiments should yield, supposing that the data tabulated are correct, and also supposing that allowances have to be made for incorrect temperature mea-

Number of Test.	3.	4.
Duration of test, hours	51·0	48·0
Period of gas making	40·9	34·6
Gas per hour of gas making, c.ft.	11,350	21,850
Gas per ton of coke, dry	65,600	59,050
Calorific value, gross	282·6	296·2
Therms per ton	185	175
Depth of fuel bed, ft.	4 0	7·0
Primary air per minute of blowing, c.ft.	4,740	3,310
Steam per minute of run, lbs.	7·70	18·85
Water gas—		
CO_2	6·00	4·50
O_2	0·10	0·10
CO	39·00	41·60
H_2	49·20	50·44
CH_4	0·10	0·25
N_2	5·60	3·15
Blow gas—		
CO_2	19·06	14·55
O_2	0·33	0·10
CO	2·84	9·29
H_2	0·51	3·71
CH_4	0·48	0·77
N_2	76·78	71·58
CO_2 : CO	8·70 : 1·3	6·22 : 3·78
Blow, minutes	½	1
Run	6	4
Temperature of blow gas	860	745
Temperature of water gas	650	640

surement, and for loss of carbon, reckoned as percentage loss on the carbon gasified as blow gas. The following are the results of the calculations:

TEST 3.

Temperature of Blow Gas.	No Loss.	5 P.Ct. Loss.	10 P.Ct. Loss.
860° C.	72,560	70,810	69,220
960° C.	67,260	65,930	64,190

TEST 4.

Temperature of Blow Gas.	No Loss.	5 P.Ct. Loss.	10 P.Ct. Loss.
745° C.	66,680	64,880	63,150
845° C.	62,770	61,130	59,400

Comparing these figures with item 5 in the previous table it will be clear that the results of these tests would require considerable correction to make them balance. However, as they are strictly comparable, they show clearly that the high CO_2 : CO ratio in the blow gas is a factor which makes for efficiency. While the conditions arrived at in Test 3 make for the higher gasification efficiency, they necessitate the slowing-down of output—a matter which we are not now considering.

42. It has been shown that in studying the results of tests carried out on water gas plants balance-sheets should be compiled showing, not merely that the total energy of the fuel is utilized, but also the relationship between the run and the blow processes. If balance is not then obtained, it is clear that the experimental results are at fault. Study of the published results of experiments show that they are subject to error, owing partly to errors in estimating the sensible heats of the gases leaving the generator, and partly to the fact that, as no allowance is made for loss of carbon, otherwise than as ash, clinker, &c., the amount of carbon supposed to be gasified as blow gas always appears to be too high. In order to extend our knowledge of the subject, experiments should be carried out in which one factor only is varied at a time. Thus, by keeping a constant depth of fuel bed, changing the velocity of the blast, or by maintaining a constant blast velocity and varying the depth of fuel bed, and by varying the size and quality of the coke under either set of conditions, we should obtain definite and valuable information as to the exact influence of these important factors. Measurement of the amount of primary air entering the plant would also serve as a valuable check on the consumption of carbon in the blow process.

Discussion.

The CHAIRMAN said it was desirable that the discussion on the paper should be opened by a representative of the Fuel Research Board. Dr. Lander, the Director of the Board, would very much have liked to be present, but was prevented by another engagement. He would therefore ask Mr. King, as the Chief Chemist, to open the discussion.

Mr. KING, after expressing regret that Dr. Lander could not be present, said he had listened to the paper with very great interest. It should undoubtedly initiate a very considerable difference in the methods of tackling the problem of water gas manufacture, and he particularly felt gratified that Dr. Travers should have used for the working out of his theoretical consideration of the problem the results given in one of the papers by the Fuel Research Board. The methods by which the volume of water gas theoretically obtainable per ton of coke gasified was calculated were particularly interesting; and there were one or two points to which he would like to refer. In the examples taken from the Fuel Research Station data, the water gas in test 4 contained 3 p.ct. more carbon than the standard gas chosen by Dr. Travers. This was certain to make some difference in the theoretical gas produced—which difference would be still further increased by the fact that his coke was lower in carbon content than the 85 p.ct. chosen as the standard by Dr. Travers. This consideration was bound to reduce the difference between Dr. Travers' calculated volume of water gas and the values observed by the Fuel Research Board. He would like to ask Dr. Travers if these differences had been allowed for.

Dr. TRAVERS: Yes.

Mr. KING, continuing, said the temperatures recorded by the Fuel Research Board would also be nearer to those actually occurring in the gas leaving the hot coke. He would like especially to point out that Dr. Travers referred to the Fuel Research Board temperatures as inaccurate; but this was scarcely a fair statement, as the temperatures were supposed to be definitely those of the gas leaving the plant. The temperatures were taken very carefully with platinum thermocouples using bare wires; and they were in the stream of gas immediately up against the generator. They were not out to measure the temperature of the gas leaving the coke, but the temperature of the gas leaving the generator; and they were very careful to check the tests and watch for any lag. The temperatures could not therefore be called inaccurate because they did not measure the temperature of the gases leaving at another point of the system. He would like to assert that the temperatures were accurate to within a few degrees Centigrade of the conditions prevailing at the points of measurement. The temperatures were taken with a view to measuring the waste heat available for recovery, and no attempt was made to measure the temperatures inside the generator, as such measurement was greatly complicated by the effects of radiation from the hot coke. No doubt Dr. Travers was correct in using the temperatures of the gas leaving the coke for his calculations of chemical composition; but it seemed to him that for the purpose of a heat balance the temperatures leaving the generator must be considered, as any difference in heat content between the two points was taken-up partly by the generator itself, partly by the flow of steam into the coke, and partly by radiation. In the Fuel Research Board Report they did not publish the results of some air measurements. These were carried out using the Pitot tube; but in the water gas plant in question the amount of straight tube leading to the generator was very small, and there was turbulence of flow. For this reason the results were not published—being insufficiently accurate. However, he would like to draw attention to one of these tests. In the last test there was a difference of 8 p.ct. between the air actually measured and the quantity of air calculated from the carbon balance. This volume of air was a function of the carbon that was being lost during the clinkering period. Even if this were correct—it was doubtful to at least within 2 p.ct.—it bore out the assumption that a considerable proportion of carbon was lost other than in the blow gas. This was more or less in agreement with the 5 p.ct. assumed by Dr. Travers, allowing, of course, for the loss in the clinkering of the ash.

Dr. TRAVERS apologized for saying in the paper that the temperature results of the Fuel Research Board were inaccurate. It was a slip in the printed proof of the paper, and it would be struck out later on, before final publication. As a matter of fact, the results of the Fuel Research Board were so close to his own theoretical ones that he offered the staff of the Board his personal congratulations on the results, which were very fine indeed.

Dr. PEXTON said he had not had time to read the paper carefully, but there was no doubt that water gas plants differed enormously in their output, to the extent of something like 10 p.ct. The paper gave a clue which would help in tracing out why these differences existed; and they were particularly indebted to the author for pointing out the importance of the loss of carbon during the clinkering period and its effect on the efficiency.

Mr. N. E. RAMBUSH said the point made by the author as to the considerable loss of carbon during the clinkering period was confirmed by actual practice. Eighteen months ago he put into operation three blue water gas producers which were worked at the rate of 1,500,000 c.ft. per day. They were not clinkered for a whole month, and were provided with mechanical clinkering devices. It was found that the yield during that period was 71,000 c.ft. of 300 B.Th.U. gas per ton. Thus it would be seen that the considerable loss during the clinkering period had been done away with. Since then, the generators had been modified, and the rate of gasification had been increased to 2½ million c.ft.; but the result was to bring down the efficiency from 75 p.ct. to 71 p.ct., which opened up the question of higher gas temperatures referred to in the paper. Incidentally, referring to the terms used in the paper, he thought it was time that the Institution of Chemical Engineers and other interested bodies took up the question of a standard notation for dealing with these problems, in order to avoid the mixture of systems now in use. As to the ratio of CO and CO_2, he had made a test, and found an average of 16 p.ct. CO_2, while the CO content was between 4 and 4½ p.ct. He had not been able to explain this yet, because he had not the necessary apparatus to enable him to do it; but he believed it was partly due to hydrogen and also partly due to the fact that the test was made at a different portion of the plant from that taken by Dr. Travers in making his calculations.

Dr. TRAVERS said he had taken the air as dry.

Mr. RAMBUSH did not agree with Dr. Travers that the usual radiation loss in producer work was 1 p.ct. He had found it to be 2 p.ct., though this figure depended on the design of the plant. With regard to the use of a positive blow *versus* a fan, it was usual to use the positive blower; but he had gone over to centrifugal blowers for the reason that fluctuations in load were more easily carried with this type than with the positive blower.

Dr. TRAVERS said he was only referring to experimental work.

Mr. RAMBUSH, continuing, agreed that the fuel bed had a very great effect on the results obtained. At the same time, he did not agree that there could be such a difference as 100° to 200° C. in the temperature of the fuel bed unless the temperature was measured at a considerable distance from it. If there was such a drop in temperature as had been indicated—and it might exist in some cases—then there must be some means by which the heat was being conducted away; but generally speaking he did not know of any generator in practice where the

amount of heat lost from the top of the surface of the fuel bed to the gasholder branch was likely to cool the gas by more than 25° or 50° C.

Dr. TRAVERS said he thought Mr. Rambush must have misunderstood him on this point. [Note communicated by Dr. Travers. Both Mr. King and Mr. Rambush appear to have misunderstood Dr. Travers on the subject of temperature measurements. He did not concern himself with the change of temperature in the gas between leaving the fuel bed and entering the channel through which it left the plant. There must, of course, be some fall in temperature, and the heat loss was accounted-for as loss by radiation and conduction from the upper part of the plant. He suggested that the temperature of the blow gas would usually be about 200° higher than that of the water gas, though the absolute temperature and the difference of temperature would fall with increase in depth of fuel bed, and would increase with increase in blast velocity. However, he did suggest that there must be some loss of heat by radiation from a thermo-junction placed in the stack pipe, and the error so introduced would increase with the temperature of the gas. This matter required further investigation.]

Mr. RAMBUSH said the ordinary temperature measurements were not taken by the wire system, but by means of protected thermo-couples. Nevertheless, even then only average temperatures could be obtained.

Prof. E. C. WILLIAMS emphasized the point made by Mr. Rambush that the Institution should take up the question of arriving at some system of standard units. Personally he thought there was a great advantage in working in molecular quantities instead of c.ft.; and any such effort towards obtaining a standard system should take the training institutions into account, in order that students could be brought to use such a standard system.

Prof. F. G. DONNAN asked to what extent rotary grates were used in producers.

Dr. TRAVERS said that rotary grates were being used on both producer plants and water gas plants, and there were several plants working extremely well in this country. He believed that part of the virtue of the rotary grate was that it kept the whole thing well shaken-up, and there was no holding-in of the fuel bed.

Mr. J. S. TOWNEND said that as the Chairman had suggested that someone connected with the experiments referred to in the reports to the Institution of Gas Engineers should speak, he might say a few words. He had had the privilege of working with the staff at Birmingham when the Institution of Gas Engineers' experiments mentioned in the paper were carried out; and it might be of interest if he briefly recounted why they were carried out. Those concerned were engaged mainly in obtaining the efficiency of the process, starting with steaming in verticals and going on afterwards to the manufacture of blue water gas—*i.e.*, the efficiency of the process as actually carried out in practice at the time. They were not out in any way to get the best results. Consequently, all their experimental work was directed to that one end, especially as the plants were actually making a gas which was being used for town lighting. Thus, what he might call the internal factors were not investigated so much as the over-all results of the experiments. The later series of experiments that were described in the Tenth Report were directed towards ascertaining the effect of lowering the fuel bed; but the experiments of the Sixth Report, referred to by Dr. Travers, were purely for obtaining the efficiency under practical working conditions. Hence the makes per ton of coke obviously should include the losses that occurred during regular working. Unfortunately, with the ordinary working, when clinkering was carried out by hand, the loss of carbon during the clinkering period must be taken into account. The time taken for clinkering varied considerably with different kinds of coke; and during the original experiments the clinker from a particular coke needed a lot of removing from the generator. This point was realized by designers of water gas plants, because during the clinkering period a lid having a small hole, was generally put on the top of the stack, for the purpose of cutting-down the amount of air passing through the fuel bed during clinkering. It would not, of course, be possible to do away with some draught, owing to the necessity for keeping the fumes away from the men working on the plant. It seemed to him that the only way in which the loss of carbon during the clinkering period could be cut down was by the use of mechanical grates. The effect of employing superheated steam, referred to by Dr. Travers, was fairly well known—viz., that the efficiency of the process could be increased thereby. In regard to this, however, a practical difficulty came into play—viz., the question of the firebars. One other point to which reference might be made was the measurement of temperatures. Dr. Travers had scarcely done justice to that question. In the tests of the Institution of Gas Engineers the object was to test the efficiency of the water gas generator under ordinary working conditions, and consequently they were not primarily concerned with the temperature at which the gases left the fuel bed, but with the temperature of the gases after they left the generator. Thus the temperatures recorded in those experiments were taken about 2 in. outside the shell of the generator. Here again, the utmost trouble was taken to ensure that the readings were accurate. In addition to very thin base-metal couples, the platinum couple was used in order to be certain that the results were within the limits of experimental error; and he believed that for the purpose of the experiments at Birmingham, the temperatures were within the limits of experimental error. If, however, they were attempting to determine the inner factors which were concerned in the water gas process, then a considerable elaboration of the experiments must be made. Not only must the temperature of the gas leaving the fuel bed be accurately determined—a thing of extreme difficulty—but the amount of air going into the generator during the blow must also be accurately measured. Mr. King had referred to the difficulties which cropped-up when using Pitot tubes; and when it was considered that the whole operation of blowing, in the blue water gas process, was for something less than a minute, varying from nothing to a maximum during the first 15 seconds and then being closed-down within a few seconds, the determination by Pitot tube, or by air flow at all, was a matter of extreme difficulty. Probably the only accurate way would be to take it from a holder.

Dr. R. LESSING pointed out that, while the previous speaker had mentioned that the tests of the Institution of Gas Engineers were conducted with the view of getting a practical test, Dr. Travers was an idealist, or at least he aimed at ideal conditions. This was the right course, and was the only way in which they could proceed along the path of progress. It was also noteworthy that the ideal conditions at which Dr. Travers had aimed were almost approached by the results of the Fuel Research Board. There was one practical point which arose out of the highly interesting, though very difficult, calculations in the paper. The main difficulty in the water gas process, in his view, seemed to be the clinkering trouble and the loss during clinkering; and this brought into consideration a subject which had been given a great deal of attention by himself—viz., the organic constituents in coal. He could not help feeling that the results would be much clearer, and labour in their calculation would be saved, if in future the question of the ash in coke was cut out altogether. Clinkering troubles would then disappear; and he hoped that this would be realizable practically in the next few years. For testing purposes, it would be of the utmost importance if cokes could be used having the minimum ash content practicable. In other words, coals should be washed and selected so that only those likely to give the least trouble in clinkering were used. If in this way they got a coke with a very much higher carbon content, he ventured to think the position would be much simplified. At present there was absolutely no control over the loss of carbon which came away with the ash. With regard to the velocity of blow, there was no doubt that, for testing purposes the positive blower would be a very excellent thing; and if this were used, it would be possible to obtain a clearer insight into the whole question by keeping the fuel bed at the same depth in different experiments, but altering the size of the coke. In other words, they would then get not only a different velocity but also a different time contact while maintaining a constant fuel bed depth.

Dr. TRAVERS agreed that the question of CO and CO_2 content was considerably affected by the ash. At the meeting of the Institution of Gas Engineers he had suggested that the action of tar in the gas during the complete gasification of coal masked the ash and inhibited the conversion of CO_2 into CO in the fuel bed. Again, the question of the size of the coke had been mentioned at the Institution of Gas Engineers' meeting; and someone had said, he believed, that the smaller it was, the better. At the same time, if it were small enough, it might all be blown up the stack, which certainly would not be economical. In reply to Mr. Townend, he said he fully appreciated how these tests were made, and the difficulties which surrounded them, because the composition of the gas could not be varied by more than a fraction of 1 p.ct. Altogether the experiments were a remarkable piece of work.

Mr. C. S. GARLAND, proposing a hearty vote of thanks to Dr. Travers, said the paper was one of those which supplied the answer to the people who had said there was no need for an Institution of Chemical Engineers.

The CHAIRMAN, in putting the vote of thanks, which was carried with acclamation, said he hoped that the Institution would take up the question of standard terms and units referred to by Prof. Williams.

The next meeting was announced for Dec. 10.

AMERICAN GAS ASSOCIATION.

Review of Reports and Papers.

[FOURTH ARTICLE.]

Relations with Customers.

Of recent years much consideration has been given by gas companies to the question of improving their relations with their customers: and the result of this, in the opinion of the Committee on Relations with Customers, is that the attitude of the customers towards the undertakings, from being one of antagonism, or at the best placid indifference, is fast becoming one of real interest and sympathy.

For submission to this year's convention, four fresh subjects were selected, and each one delegated to a separate Sub-Committee, who prepared a report.

Correction and Prevention of Errors.

The first Sub-Committee (under the chairmanship of Mr. J. M. Roberts, of the People's Gas Light and Coke Company, of Chicago) considered the correction and prevention of errors. The opinions of some people, they say, are adverse to planning a comprehensive "error system," in the belief that such plans cause resentment among employees and are costly; but their own belief is that systematic check-ups and reports are beneficial, stimulate morally, and eliminate any resentment, though they admit there is an item of cost in maintaining such a procedure.

Improving Public Relations through Employees.

Mr. W. H. Barton, of the Portland Gas and Coke Company, presided over the Sub-Committee entrusted with the question of improving public relations through employees calling at customers' premises. In order that employees may be of the greatest value in this direction, they must, of course, first of all be specially trained. Substantial and permanent results are obtained only by influencing and instructing the employees over a long period of time, until their old habits are forgotten, and they become imbued with the spirit of service, which many times means actually remoulding an employee's character. Many companies have found that the use of instruction booklets covering the different activities of the outside men has been the most important factor in their training. Outside employees have plenty of opportunities to increase the sale of appliances, and therefore should be given general information by the sales department concerning apparatus in common use.

Many customers and other persons who have no specific complaints, or who do not enter such complaints if they have them, occasionally make critical or derogatory remarks about the company. A method should be provided enabling employees in their rounds of customers' premises to report these statements. Such employees are the real eyes and ears of the company, and they should be encouraged promptly to report all matters like this, and be convinced that the company are desirous of having every question asked about them properly answered, every grievance, real or fancied, corrected, and every customer's need properly attended to. A special form should be provided for this purpose, more definitely, promptly, and adequately to transmit and answer questions, requests, criticisms, and grievances relating to any part of the company's business coming to the attention of employees, both in and out of working hours.

The customer's premises provide the most fertile field in which may be cultivated friendly feelings for a utility undertaking. It is there that service is rendered—and the utility undertakings are engaged in selling service rather than in selling gas, for gas is only a means to service.

Customer and Employee Stockholders.

The task set one Sub-Committee (presided over by Mr. E. M'Morris, of the United Gas Improvement Co., Philadelphia) was to outline a model form of records and the accounting procedure to be used, as well as to set forth an organization plan to be followed and the best methods to be employed, by a company in carrying on a successful campaign for the sale of their securities to customers and employees. It is computed that during the past few years approximately 1½ millions of stockholders have been added to the ranks of those interested in the properties of public utility undertakings by means of the "customer-ownership" plan, and that these people have put into the business some $500,000,000. An increasing number of companies are adopting the plan, the greatest merit of which is found to lie in the fact that it has promoted and established a cordiality of relationship and understanding between the utilities and the public. The stock should be made available to the partial-payment subscriber, and liberal interest should be allowed on such partial payments.

The Sub-Committee recommend that companies should make every possible effort to interest their employees in becoming shareholder-partners. This is an asset which tends greatly to improve the relations with the customers. The employee who is the "point of contact" with the customer realizes more to-day that his acts toward customers in establishing better friendly relations reflect back to the credit of the utility, and he in turn is benefited. The larger the number of employee shareholders, the greater will be the interest shown, and the better will be the knowledge acquired of the company's affairs.

Welfare of Employees.

The fourth report is on the welfare of employees as affecting the relations of a company with their customers, and it is by a Sub-Committee under the Chairmanship of Mr. O. F. Potter, of the Public Service Gas Company, Newark, N.J. They have gone very fully into their subject, and at the conclusion of their work are "more definitely convinced of the possibilities of improving the relations of the company with the customer through the medium of a satisfied personnel, and more enthusiastically in favour of improving that personnel by methods well within the power of companies. While essentially a great deal of this work involves the application of the human aspects of the business, there are certain parts which of necessity must be systematized."

Believing that the qualities of loyalty, accuracy, and punctuality—in fact, everything that means an efficient employee—should be recognized in some tangible way, the Sub-Committee present a scheme, the object of which is to give the most efficient employees of the company an owner's or shareholder's interest in the business, thus affording to all employees a new motive for endeavouring to promote the prosperity of the company, and an opportunity to improve their financial circumstances. It is intended that the plan should be experimental, and that its success and continuance should depend wholly upon the employees. Unless their added interests results in greater economy and profit to the company, and improved service to the public, as well as in financial benefit to the employees, the profit-sharing scheme should be abandoned.

The report also discusses group insurance, sick benefit, and death benefit, and pension and medical attendance plans.

Standard Meters versus "Lights" Meters.

In our issue of Nov. 19, reference was made to the standard type of gas meter, and it was mentioned that an attempt is to be made by one manufacturer to eliminate the "lights" type. Messrs. George Glover & Co., Ltd., remind us that they were among the first of the manufacturers to commence supplying the standard meter. While their policy has always been to recommend this in preference to the "lights" type, it is realized that the change-over, as in many other things, must be gradual; and though they will continue to advocate the standard meter to gas undertakings, they will still be happy to supply the "lights" type where required at prices comparable with the reduced rates now obtaining for the standards.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Smoke Abatement Conference, Manchester.

SIR,—On p. 428 of your valued issue of Nov. 12, Dr. E. W. Smith is quoted as follows:

"I may be supplied with insufficient facts, but I have never been able to see how low-temperature coke can be an attractive and profitable proposition compared with the coke produced by the gas industry or with coal itself. I do not think that it is ever going to be possible to force the community to use, for æsthetic or health reasons, a product that is dearer than another. It is necessary to provide the consumer with something which will take the place of that which is harmful, at a cost which is no higher."

Through the courtesy of the "JOURNAL," I would like to state that my own actual experience is diametrically opposed to Dr. Smith's expressed opinion. I am a resident of Dursley, a small but industrial town of some 3000 inhabitants, mostly of the artisan class. Pending the erection of a low-temperature carbonizing plant at the local gasworks, in which I am interested, I have been receiving a weekly truckload of Coalite from Barnsley. This has been placed on sale through a local coal merchant, with the sole purpose of testing its saleability as against coal among the artisan classes. No special advertisement has been employed by me or the coal merchant; he was simply instructed to place the Coalite on sale at 65s. per ton, delivered, as against good house coal at 50s. per ton. The result has been absolutely astonishing. The poor people, to whom the fuel was sold, were quick to recognize its economic and other advantages over best coal, even at 15s. per ton higher price; and twenty trucks of Coalite could be sold in this place weekly with the greatest of ease. The fact remains that the artisan class, for whom economy in fuel costs is a vital necessity, are demanding smokeless fuel in place of coal at a considerably higher cost; and I am prepared to give the name of the local coal merchant in substantiation of my information. The Chairman of the Dursley Gas Light and Coke Company, Ltd., is prepared to give similar evidence. I therefore maintain that Dr. Smith's opinion has no real ground for foundation, and that the British public are prepared to pay a good price for a good article.

In conclusion, I would like to state that I have used Coalite in open grate and kitchen range for a year, have found it an admirable fuel, and by its use have economized to the extent of at least £10 over my former coal bill for the year.

G. C. DEW.

Reine Barnes, Dursley, Glos.,
Nov. 19, 1924.

A Plea for the Defence of Gas Investors.

SIR,—Referring to the editorial "A Plea for the Defence of Gas Investors" in your issue for Nov. 19, may I point out how investors are protected in America? No prospectus over there is issued without (1) a lawyer's report passing on the legality of the issue, (2) an auditor's report passing on the correctness of the figures, and (3) a valuation certificate passing on the correctness of the values.

The concerns whose certification is dependable soon become known. Serious issuers are anxious to have their prospectus certified to by serious experts; and if the public will invest in undertakings that offer no guarantee but the enthusiasm (?) of the promoters, they can pass the subsequent losses to the credit of experience account.

This method does not seem to be generally prevalent in this country; so I trust you may find my letter of general interest, and allow it space in your valuable publication.

W. ISAACSON.

7, Union Court, Old Broad Street,
London, E.C. 2, Nov. 20, 1924.

Currency Decimalization.

SIR,—Thank you very much for your criticism regarding my proposals to decimalize our money. My proposals were written so as to provoke criticism, for, simple as they are, they do not appear to have been mooted previously, and I must say that the criticism which has been forthcoming on a matter which has engaged the interest of experts for over thirty years is most disappointing. I have been waiting for the heavy artillery to make its appearance, but so far there has only been a noise comparable with a pop-gun.

It is just over thirty years since this Drake first set foot in America; but once there he stayed for a lengthy period, as distinct from just a visit. In fact, he had a few years of residence on the other side, and he speaks with the intimate knowledge of one who had to accustom himself to think not only in different terms, but in different values also—not in big financial transactions, but in connection with the retail side of business, where you state the chief trouble would be.

You describe it as "ugly" to call a shilling "twenty-four cents.' Why do you confine yourself to this coin only? Had you taken further examples, in all probability the weakness of this particular instance would have become apparent. First of all, if you were asked the price of an article you would most likely reply "One shilling," not simply "Shilling." Therefore there would be two words against three words in twenty-four cents; but what about the following instances?

Half-a-crown being sixty cents.
Three and elevenpence halfpenny against ninety-five cents.
One nineteen eleven and a half (speaking shorthand) being nine fifty nine.
One pound and three halfpence being four eighty-three.

The instance you have taken is rather unfortunate, is it not?

Concerning the difficulties of the customer in realizing values under the new terms, only this last week in London I have been in stores

where prices were expressed in both English and French currencies, and, again, in both English and American; while if you go to Paris you will find stores with prices marked in French, English, and American currencies. The very fact of seeing these prices side by side quickly educates one as to comparative values. No necessity there, Mr. Editor, to be walking about with the "simple little table" in one's hand!

Regarding the conversion of prepayment gas meters to the Decimal System, there would be no necessity for this at the present moment. The greatest of all arguments in favour of my suggestion is that the two currencies can be used side by side. I do believe, however, that the great majority of prepayment meters are "penny-in-the-slot," and therefore they are already on the two-cent basis, and would require no alteration at all. Regarding "shilling slot meters," I find advertisements in your Journal advertising meters with prepayment attachments to suit any coins, and also mechanism for varying the amount of gas which may be sold for any particular coin. Therefore, so far as I can see, there is no difficulty whatever in this direction. It would, however, be very interesting to hear from the meter manufacturers as to whether my proposals would entail any difficulties for them. Are not all meters read in tens, hundreds, and thousands, and are not all gauges on gas-works in tenths of inches?

I feel that the objections raised so far are merely the Englishman's ingrained objection to a change, and are purely prejudice. No serious snags have yet been raised; and until they are I shall feel that my proposals are practicable.

J. Wilfrid Drake.

Ovenden, Halifax, Yorks., Nov. 24, 1924.

A Low-Temperature Carbonization Test.

Sir,—With reference to the article which appeared in your issue for Oct. 29 under the above heading, we are requested by the Committee of the Privy Council for Scientific and Industrial Research to inform you that we had no knowledge of the issue of the neostyled document, misnamed a summary, and referred to in your article. We were not even aware of its contents until it was brought to our attention.

Moreover, it was not issued in the form adopted by, or with the authority of, the Company—which kindly note.

Low Temperature Carbonisation, Ltd., James H. Macaulay.
14-16, Cockspur Street, London, S.W. 1,
Nov. 19, 1924.

[The communication to the Press upon which we commented bore at the top the words: "From the Low Temperature Carbonisation Ltd., 14-16, Cockspur Street, S.W. 1." Perhaps the Company will try to run to earth the person responsible for issuing an unauthorized communication to the Press in their name and from their address.—Ed. "G.J."]

Concrete Gas Purifiers at Burton-on-Trent.

Sir,—We have read with interest the article in your issue for Nov. 12, referring to the concrete gas purifiers at Burton-on-Trent, but wish to point out that this application of reinforced concrete is not new. We designed and built some purifiers at the Wolverhampton Gas-Works employing this material, and they have been working satisfactorily since February, 1921.

A little later a further set was installed by us at the Croydon Gas-Works, employing a 4:2:1 mix of concrete without any rendering or other gas-proofing material whatever; these have also proved satisfactory and have been working since August, 1921. We attribute our success in this instance to continuous concreting.

Jas. C. Hughes.

Industrial Constructions, Limited, 44, Grosvenor Place,
London, S.W. 1, Nov. 21, 1924.

Low-Temperature Carbonization.

Sir,—As this interesting topic has again been in the limelight, I trust you will allow me to add a few remarks. Recently I have acquired a new system for low-temperature carbonization as the result of the death of the inventor, the late Mr. Arthur L. Pearse, of London and New York, who succeeded in proving the value of his process and plant. The writer had been in touch with the late Mr. Pearse from June 12, 1919, to May, 1920. Early in 1921 Mr. Pearse died. In September of this year the executor of Mr. Pearse's estate transferred the process to me.

From the information at my disposal it is clear that a retort has been in successful operation in accordance with the inventor's latest methods from Sept. 12, 1920, until early in 1921. This plant was at Cresson, U.S.A. According to the last designs there are two types of horizontal retorts, one intended for intumescent materials and the other non-intumescent grades.

Temperatures ranging from 800° to 2000° Fahr. are used, with three different mixtures or alloys, to which are attributed a great deal of the "power of carbonization" and long life of the retort. Regular running has not been below 1400° Fahr., and there has not been any fault to find with the machine as regards durability.

The principles adopted are:

The material is heated at the temperature which will induce the evolution of the gases desired, for the major production of whatever product is desired, admitting that the fractional products have what may be called a "habitat" temperature peculiarly their own.

In practice this means progressive heating, in zones of heat "habitat" to the desired fractions but also suited to the characteristics of the different materials. Some materials give off, for example, 90 p.ct. of their volatile contents at 60° Fahr. in 18 minutes, while an oil shale gave 60 p.ct. at 600° Fahr. in 30 minutes, but refused to give off anything more until 925° Fahr. was reached, when it evolved 25 p.ct. more oil. Lignites are particularly erratic in behaviour in this respect.

Mr. Pearse considered it an axiom that good practice for light oils required 600° Fahr. or even lower as heating temperatures, whereas 1400° Fahr. is stated as desirable for a moderate percentage extraction of nitrogen as ammonia.

Having achieved zoned heating with strict temperature control, Mr. Pearse proceeded to develop to the maximum rapid treatment. The material is treated in a fine state, but not too fine, so as to avoid dust, so that it can be carbonized in 100 minutes as an average. Obviously there is a largely increased tonnage. The No. 2 retort handles 10 tons daily, No. 4 50 tons and upwards, depending upon the nature of the material.

Heating is by convection. Attention is also given to the withdrawal of the gases. This is effected by separate offtakes, worked under light vacuum, the retort being tight. The particles are maintained in a constant state of movement, and keep falling through the heat medium.

In operation, it is stated, the retort has shown that one can depend on long service, with probably few repairs. At 800° Fahr. the retort should last ten years; at 1400° Fahr. it would be advisable to use a different material and replace burned-out sections every two to three years. The retort is so designed that replacements are easy and rapid. Cast-iron shells, in duplicate, are not costly. The heat required to carbonize is about 17·5 therms pen ton without resorting to regeneration of the waste heat, which economizes some 30 p.ct. thereof.

An integral part of the process is that the operation is done in a closed circuit, so that nothing is wasted. The gas, after being scrubbed, is returned to a holder, from which enough non-condensable gas is taken and returned through the retort, after being first properly treated. The balance of the gas is sent to the burners of the retort or boiler, as the case may be.

Shortly before his death, Mr. Pearse demonstrated his retort for the production of a suitable low-temperature coke from most of the coking coals of the United States. It is claimed that this was successfully accomplished, giving coke in suitable condition, cheaply and on a commercial scale.

As the writer has been associated with the Everard Davies retort, he wishes to make it clear that he has not, in taking up the Pearse retort, abandoned his own systems. These are, however, generally restricted to mass carbonizing, which is not the Pearse method. Operating with mass charges of from 8 to 20 tons a low-temperature throughput of 24 to 30 and 60 to 75 tons daily per setting of two retorts is available. The solid product is a marketable one.

Wm. Everard Davies.

5, Tynybedw Terrace, Treorchy, Glam., Nov. 17, 1924.

LEGAL INTELLIGENCE.

CLAIM FOR PERSONAL INJURY.

On the 20th and 21st inst. the case of *Evans v. Sutton Gas Company* came before the Lord Chief Justice and a Special Jury; the plaintiff claiming damages for personal injuries caused by the alleged negligence of the plaintiffs' servants in not properly filling-up an excavation in the road after laying a gas main.

At the time of the accident, the plaintiff was a packer, his wages averaging £3 a week. One day, 1923, while passing over a trench in the Waterloo Road, Sutton, on his bicycle, he was thrown and broke his collar-bone. The alleged negligence was that the defendants failed to replace the excavated earth in a proper and safe manner. Plaintiff further alleged that the defendants failed to give any warning of the dangerous condition of the road.

The defendants admitted that their servants had opened a trench in the road, as they lawfully might do, in pursuance of their statutory powers, but they denied that the excavated earth was badly replaced, or that they were guilty of any negligence. They further pleaded that the accident was caused through the plaintiff's own fault, in not slowing-down when approaching the portion of the excavated road, and in riding, or attempting to ride, without keeping proper control over his bicycle. If they had been guilty of negligence, the plaintiff was guilty of contributory negligence.

Mr. Thorn Drury, K.C., and Mr. O'Connor appeared for the plaintiff; Mr. Hawke, K.C., and Mr. Doughty were for the defendants.

Evidence was given on behalf of the plaintiff that the trench, after being filled-in, was left in a very loose condition, not having been rammed; while for the defendants a large body of evidence was heard that the trench was properly filled-in, and could not possibly have been a source of danger.

His Lordship, in summing-up, said the question was whether there had been failure on the part of the defendants properly to restore the road. They had called evidence to prove that a perfect job had been made of the work, and it was for the Jury to say whose testimony they accepted, remembering that the onus was upon the plaintiff of satisfying them that the claim was well founded. After the trench was filled-in by the workmen of the Gas Company, the duty of making up the road was on the road authority. As there was bound to be an interval between the two operations, it was quite obvious that the defendants must take every care to leave the road in a condition reasonably safe for usage.

After an hour's deliberation in private, the Jury returned and stated that there was no possibility of their agreeing; and they were discharged.

MISCELLANEOUS NEWS.

BRITISH SULPHATE OF AMMONIA FEDERATION, LTD.

Fourth Annual General Meeting.

Increased Demand for Nitrogen—Growth in Membership—Lower Home Prices.

The fourth annual general meeting of the Federation was held on Thursday last, at the Head Office, No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON (the Chairman) presiding.

ANNUAL REPORT.

The report for the year ended May 31 submitted by the Council and Executive Committee included the following statements:

The past year was the twenty-seventh year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, and the Federation.

A NOTABLE YEAR FOR SULPHATE OF AMMONIA.

The outstanding feature of the year under review has been an increase of nearly 8 p.ct. in the world's production of sulphate of ammonia, bringing the total output up to about 2,473,000 tons, and thus securing for sulphate of ammonia the premier position among nitrogenous fertilizers, so long held by nitrate of soda. It is due to the policy of moderate prices pursued by this Federation and by the most important groups of producers on the Continent, that it has been possible in the short space of one year to introduce this large additional quantity of sulphate of ammonia, amounting to over 190,000 tons, into the world's consuming markets without a preliminary cataclysm in prices.

If the price for the year under review is compared with the average price of the years 1921-22 and 1922-23, it will be seen that the 8 p.ct. increase in consumption has been secured at a cost of a reduction of 10 p.ct. in the price. This reduction in the price of sulphate of ammonia has taken place over a period during which the price of nitrate of soda has been firmly maintained, and, indeed, slightly increased, and for some years prices for sulphate of ammonia have been below the parity of nitrate of soda.

The reason for this apparent anomaly is not far to seek. The nitrate of soda producers have succeeded in reducing their stocks in Chile, and in maintaining their selling price, by the simple expedient of reducing their production. The production of Chile nitrate was 2,822,000 tons in 1913-14, 2,296,000 tons in 1918-19, only 876,000 tons in 1921-22, and 2,187,000 tons in 1923-24. The Federation and its friends reduced their stock and marketed a largely increased production by reducing prices, and thus inducing a large increase in consumption of sulphate of ammonia. This comparison serves to bring out the radical difference between Chile sodium nitrate and ammonium sulphate. The former consists of a finite natural deposit, and is therefore a wasting asset, even though the caliche may at the present rate of production last another 400 years—a short period in the life of a State. The output of ammonium sulphate, on the other hand, is capable of infinite expansion. Hence, while a policy of restricted production and high prices may be a proper one for Chilean nitrate producers to adopt, sulphate of ammonia makers must choose other methods to secure the welfare of their portion of the world's trade in nitrogen.

Signs are not wanting, however, that the policy of the sacrifice of immediate profits for the sake of future expansion, and of spending large sums on propaganda, which sulphate of ammonia makers have for so long imposed upon themselves, and which has already been vindicated by a striking increase in consumption, is about to enjoy the assistance of external stimulus. The world is beginning to recognize, in practical application, the truth of Sir William Crooke's prediction, made a quarter-of-a-century ago, that lack of nitrogen would mean starvation. Of Far Eastern nations, the Japanese have been the first to take the lesson to heart; and the remarkable agricultural development fostered by the Japanese Government in Korea, Formosa, and other outlying portions of that island Empire, together with intensive cultivation in Japan proper, is responsible for the fact that the Japanese Empire consumed about 137,000 tons of nitrogen in various forms last year (equivalent in terms of sulphate of ammonia to 685,000 tons). Competent observers are of opinion that both India and China are rapidly reaching a point at which the present rate of expansion in population can only be maintained by a large increase in the use of nitrogen. As the population of these two countries alone is over 700 millions, 90 p.ct. of whom depend on the land, it will be seen that their possible consumption of nitrogen is gigantic.

A remarkable development has also taken place in the use of nitrogen in the tropical dependencies of the United States of America. Cuba, Manila, and the Hawaiian Islands this year consumed between them 54,000 tons of ammonium sulphate, as compared with about 10,000 tons, all told, before the war. In the United States, the consumption of nitrogen has hitherto been backward. American fertilizer policy has been dictated by the needs of the meat-packers and the acid phosphate makers, and the farmer has had to put-up with a profusion of low-grade fertilizer, wasteful alike in transport and labourers' wages. But the crusade in favour of high-grade fertilizer, so long and so fervently preached by the United States Department of Agriculture and its numerous and well-equipped experimental stations, is now receiving powerful reinforcement by the economic conditions created by the fiscal policy of the United States and by the growth of that mountain of the world's dumped gold, which rises inexorably higher, year by year, in New York as the British debt is paid. The North American farmer is beginning to realize that he can only pay the high wages which the tariff imposes on him and accept the world's low prices for his surplus cotton and wheat, if he uses high-grade fertilizer, and that means, in two words, more nitrogen.

The problem has been admirably stated in the "Bulletin" of the United States Department of Commerce entitled "Nitrogen Survey," which thus summarizes the position: "There seems no escape from the conclusion that, unless relatively cheaper fixed nitrogen can be supplied to agriculture, steady decrease in crop production must continue, while our population is increasing rapidly. The end of the programme (of extensive cultivation) is approaching, not only because all of the easily available areas are under cultivation, but also because high labour and material costs and the accompanying high freight rates are powerful factors acting to restore the acreage of cultivation. Intensive crop production must ultimately be secured, and one very vital problem in such a programme is the securing of cheap nitrogen."

Finally much work remains to be done at home. While it is gratifying to be able to report a further small increase in our own consumption of sulphate of ammonia, recent experiments at Rothamsted point to the conclusion that far heavier quantities of nitrogen could safely and profitably be applied to both potatoes and cereals, than are at present used. This conclusion is well illustrated by the following table, recently compiled, showing how far Great Britain and France lag behind countries in which the intensive use of fertilizers is understood, and is still undergoing expansion. The countries that obtain the highest yields are those which use the largest amount of fertilizer per acre of cultivated land:

Consumption of Fertilizer per Acre of Cultivated Land.

—	Phosphoric Acid.	Nitrogen.	Pure Potash (K_2O).
		Lbs. per Acre.	
Belgium	59·30	23·33	8·60
Netherlands	51·30	32·25	43·36
Germany	18·48	10·30	18·56
England	20·87	5·57	2·85
France	12·40	2·60	1·18

These considerations may serve to encourage a moderate optimism in the minds of sulphate of ammonia producers, and we think they will be justified in concluding that, if the last few years have been lean years, it should be possible in the future to raise the price for sulphate of ammonia to a level more nearly approaching the parity of nitrate of soda than has been possible in the past. By reason of the unity of their geographical position, the Chilean producer will, for some years to come, play the chief part in fixing the world's price for nitrogen, but it will fall to sulphate of ammonia makers to supply the largest share of the world's needs of nitrogen.

WORLD PRODUCTION AND DISTRIBUTION.

The figures given in the table below showing the world's production and consumption of sulphate of ammonia are necessarily, to some extent, estimates, but there is no reason to doubt that they convey a reasonably accurate picture of the general position for the fertilizer year ended May 31, 1924. (Ton = 2240 lbs.)

—	Production.	Consumption.
Group 1.—Germany, United Kingdom France, Belgium, Holland, Scandinavia, North Russia, Poland, Czecho-Slovakia, and Switzerland	1,877,000	1,556,700
Group 2.—Countries bordering the Mediterranean other than those in Group 1	35,000	139,350
Group 3.—Indian Empire, Philippines, Straits, Dutch East Indies, Siam, Japan, and China	127,000	442,700
Group 4.—Africa and neighbouring islands (excluding Egypt)	1,000	7,250
Group 5.—United States, Canada, Central and South America, West Indian Islands, Cuba, and Hawaii	417,500	306,730
Group 6.—Australia and New Zealand	15,100	10,300
	2,472,600	2,463,230

British and American exports of sulphate of ammonia for the last four calendar years were:

Exported from	United Kingdom.	United States.	Total.
	Tons.	Tons.	Tons.
1920	110,016	89,566	199,582
1921	128,433	102,614	231,047
1922	144,342	147,331	291,673
1923	247,560	150,595	398,155

HOME PRODUCTION AND DISTRIBUTION.

We give our usual table showing production and distribution. The figures for total production are taken from the Alkali Inspector's report, and relate to the calendar year, while the remaining figures relate to the "fertilizer" year, commencing June 1 in each year. Hence the quantity stated below as exported for "1923" was exported during the year from June, 1923, to May, 1924.

The total production of sulphate of ammonia, as such, for the year ended May, 1924, may be estimated at about 401,000 tons. The total quantity used in Great Britain and Ireland for all purposes may be taken as 143,200 tons, and the Customs returns show that 259,680

	Total Production of Ammonia as Sulphate of Ammonia. (Based on Alkali Report.)	Production of Sulphate of Ammonia as such.	Exported. (Customs Returns.)	Use for Home Agricultural Consumption.	Nitrate of Soda Used for Home Agricultural Use.
1913	432,600	372,000*	324,100	40,000*	80,000*
1914	426,400	363,000*	306,430	50,000*	80,000*
1915	426,300	350,000*	265,000	64,000*	40,000*
1916	433,700	315,500	188,860	144,600	5,000*
1917	458,600	283,500	32,220	234,000	5,000*
1918	432,600	331,500	38,450	269,000	10,000*
1919	397,500	361,360	116,570	233,500	40,000*
1920	409,875†	315,630	135,130	166,920	40,000*
1921	260,850†	229,390	117,690	136,000	55,000*
1922	361,675†	340,000	187,600	140,200	57,000*
1923	441,632†	401,400	258,350	142,400	50,000*

* Estimated. The nitrate of soda figures are only rough estimates.
† Basis 25 p.ct. ammonia.

tons were exported; but this figure includes 1330 tons delivered to the Channel Islands, which we include under home use.

HOME AGRICULTURAL CONSUMPTION.

The year under review opened with poor prospects for farmers; and the uncertainty of the political outlook culminating in the general election in November, 1923, made it seem likely that there would be a diminution in consumption. Orders were sparingly placed for the first six months. The deficiency was fully made-up in the spring, however, and we estimate an increase of about 2000 tons in the total quantity of sulphate of ammonia delivered for home use. The detailed figures for sulphate of ammonia are as follows:

Home Consumption in	Scotland.	Ireland.	England, Wales, and Channel Islands.	Total.
1919-20	71,900	42,000	119,600	233,500
1920-21	50,900	26,000	90,020	166,920
1921-22	33,600	19,400	83,000	136,000
1922-23	42,100	20,000	78,100	140,200
1923-24	41,000	21,800	79,600	142,400

EXPORTS.

The net increase in exports for the year amounts to 70,000 tons, following on last year's increase of the same figure. Japan accounts for the bulk of this increase, having taken no less than 68,000 tons more than in the previous year, in spite of the earthquake. The figures for Spain show a slight falling off; but this was due to shortage of supply here, and not to lack of demand. In order to maintain our trade in that country, we made an arrangement with Continental producers whereby 17,000 tons of their production was sold in Spain by us. Total Spanish imports, therefore, show a satisfactory increase over last year. The Canary Islands, Italy, China, and the Colonies all show small, but satisfactory, increases.

[A table shows the quantities exported since 1913, compiled from the Board of Trade returns. This gives the following totals for the "fertilizer year" ended May 31: 1913-14, 324,100 tons; 1914-15, 306,434 tons; 1915-16, 264,992 tons; 1916-17, 188,856 tons; 1917-18, 32,218 tons; 1918-19, 38,450 tons; 1919-20, 116,567 tons; 1920-21, 135,126 tons; 1921-22, 117,691 tons; 1922-23, 187,038 tons; and 1923-24, 259,682 tons.]

MANUFACTURE: QUALITY: COST.

We wish to congratulate our members, Synthetic Ammonia and Nitrates, Ltd., most heartily on bringing into large-scale production their air-nitrogen plant at Billingham, and in maintaining an uninterrupted output from the start. This is an achievement of first-rate importance in the history of British chemical enterprise. They are already the largest individual producers in the country, and the plant is capable of extension to meet the growing demand for sulphate of ammonia, to which we have referred above.

The improvement in quality to which we alluded in our last report has been fully maintained, and well over 80 p.ct. of the total output is now neutral. Considerable improvement has been effected in the mechanical means of eliminating the free acid and rendering the final product friable and free from lumps. The advent of considerable quantities of German synthetic sulphate of ammonia on the export markets has provoked comparisons with our own neutral make. It is clear that buyers have a preference for neutral sulphate of ammonia which contains distinct crystals, and these should be as large as the plant can produce. This preliminary condition will prevent any tendency to cake, and will also make it possible to distribute the sulphate over the land without risk of its being blown about in the wind—a very considerable risk with neutral sulphate in powdery form. It is therefore desirable that all neutralizing plant which has the effect of reducing the final product to a powdery form should be immediately replaced by one of the more modern plants which preserve the natural crystals in the salt.

While general costs of production have remained much the same as during the previous year, there has been a small reduction in acid prices, which have ranged from 50s. to 70s. per ton, according to district. These prices are, however, still considerably over the price at which acid could be produced without loss by newly-installed plant, notwithstanding high cost of erection and installation.

An important contribution to the problem of economizing working costs has been made by Mr. P. Parrish, in his recently issued book "Design and Working of Ammonia Stills." We issued during the year a leaflet entitled "Revised Suggestions for Sampling and Testing Sulphate of Ammonia," which, we understand, has been helpful to members.

GENERAL AVERAGE PRICES.

The following are the average prices per ton for all deliveries, home and export, free on rail at makers' works, in single bags free:

	For 24¾ P.Ct. Ammonia.	For 25¾ P.Ct Ammonia, Neutral.
	£ s. d.	£ s. d.
1917–18	16 7 3	..
1918–19	18 6 9	19 6 6
1919–20	22 13 3	23 15 3
1920–21	21 8 8	23 0 2
1921–22	12 13 3	13 19 3
1922–23	14 0 0	15 6 0
1923–24	11 19 11	13 5 11

The yield to the Federation on quantities sold for home use was 5s. 8d. per ton less than for export.

HOME PRICES.

Below are shown the prices charged to British farmers per ton delivered to buyer's nearest station, in recent years.

PROPAGANDA WORK.

This work has been continued under the supervision of the Propaganda Sub-Committee, consisting of Messrs. A. Stanley (Chairman), S. Henshaw, R. C. Miller, R. D. M'Cowan, and R. Halkett. Mr. T. H. J. Carroll has continued to be responsible for the executive work at home, and the General Manager for the foreign propaganda. Mr. P. H. Hay has retired from the position of Agricultural Adviser, and the Committee have appointed two new Advisers, bringing the total number for England and Wales up to five. We regret to have to record the death of our Adviser for the Irish Free State (Mr. C. A. Bury). The vacancy thus created has also been filled by the Committee. With the additional staff it is hoped to make more rapid progress in inducing British farmers to use more sulphate of ammonia than has been possible in the past. The personal touch with farmers will continue to be the keynote of the work. A number of meetings of members of the Propaganda Staff have been held at regular intervals, and the exchange of ideas which is thus made possible is found to be beneficial for the work of all.

During the past season an increasing number of gas undertakings have devoted a show-window to sulphate of ammonia, and sales to small-holders by this means are beginning to account for quite an important tonnage each year. Ocular demonstrations and accurate trials to show the effect of using sulphate of ammonia have been made at 73 centres on 450 plots. While a large quantity of literature has been written and distributed, we have continued our previous policy of cutting-down newspaper advertisement to a minimum.

A new departure has been the issue of a farming paper intended to appeal specially to farmers themselves, entitled "Farm Notes on Profitable Farming." The first number met with remarkable success,

—	1917-18. Basis 24¾ P.Ct.	1918-19. Basis 24¾ P.Ct.	1919-20. Basis 24¾ P.Ct.	1920-21. Basis 24¾ P.Ct.	1921-22. Neutral Basis 25¾ P.Ct.	1922-23. Neutral Basis 25¾ P.Ct.	1923-24. Neutral Basis 25¾ P.Ct.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
SULPHATE OF AMMONIA—							
July	15 7 6	15 5 0	17 0 0	23 10 0	14 6 0	16 3 0	14 5 0
August	15 7 6	15 5 0	19 10 0	23 11 0	14 6 0	16 3 0	14 5 0
September	15 7 6	15 15 0	19 10 0	23 11 0	14 10 0	16 8 0	14 10 0
October	15 17 6	15 15 0	20 10 0	23 11 0	14 13 0 15 8 0	16 8 0	14 12 6
November	15 17 6	15 15 0	20 15 0	23 11 0	15 8 0	16 13 0	14 15 0
December	15 17 6	16 5 0	21 0 0	23 11 0	15 13 0	16 13 0	14 16 0
January	16 7 6	16 5 0	21 7 6	23 16 0	16 3 0	16 18 0	15 2 0
February	16 7 6	16 5 0	21 15 0	24 3 6	16 13 0	16 18 0	15 3 0
March/May	16 7 6	16 15 0	22 0 0	24 11 0	17 3 0	17 3 0	15 5 0
June	15 5 0	17 0 0	23 10 0	19 1 0	17 3 0	17 3 0	15 5 0
NITRATE OF SODA, 15½ P.CT. NITROGEN:—							
Spring price about	..	25 0 0	25 0 0	20 10 0	16 10 0	14 5 0	14 5 0

N.B.—The above prices for nitrate are calculated on the same delivered basis as the sulphate prices; the net price at United Kingdom ports was about £1 per ton less.

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

CALORIMETERS

PRESCRIBED BY

The Gas Referees

ARE

MANUFACTURED

:: PRINCIPALLY ::

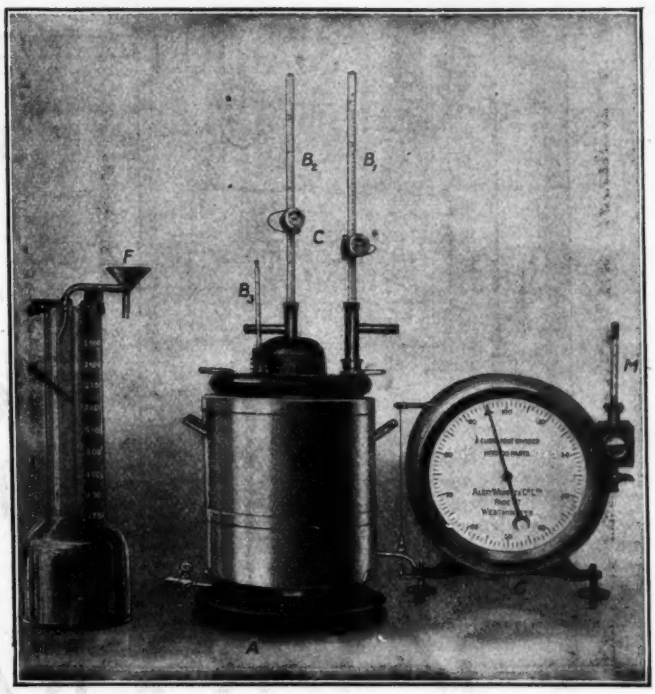
BY

ALEXANDER WRIGHT

& CO., LTD.,

1, WESTMINSTER PALACE GARDENS,

WESTMINSTER, S.W. 1.



Braddock's Gas Station Meters

No. 245.—BRADDOCK'S 1500 LTS. WET METER.

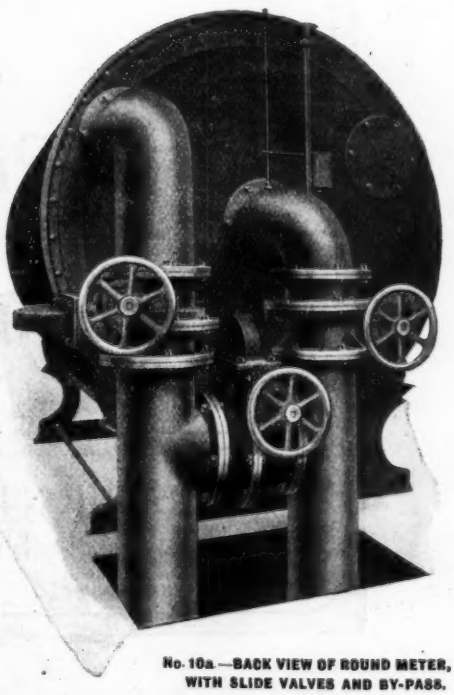
In Cylindrical Cases, for from 500 to 30,000 cubic ft. per hour.

The Best in the Market.

Dimensions and Full Particulars upon application.

OF SUPERIOR QUALITY AND CONSTRUCTION.

May be seen working up to full capacity before delivery.



No. 10a.—BACK VIEW OF ROUND METER, WITH SLIDE VALVES AND BY-PASS.

J. & J. BRADDOCK, GLOBE METER WORKS, **OLDHAM**

(BRANCH OF METERS LIMITED). Telegrams: "BRADDOCK OLDHAM." Telephone No. 815

AND 45 & 47, Westminster Bridge Road, LONDON, S.E.

Telegrams: "METRIQUE LAMB LONDON." Telephone: No. 2412 HOP

UP TO OCT. 31ST 1924

TOTAL ORDERS RECEIVED EQUAL

1,049 MILES

FROM 498 CUSTOMERS

OF THE ABOVE

REPEAT ORDERS

EQUAL

705 MILES

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM.

Telephone: ILKESTON 86. Telegrams: "STANTON, ALFRETON."

and inquiries for additional copies raised the number of copies originally printed by nearly 100 p.ct. The success of this enterprise is entirely due to Mr. Carroll. A second number of the paper is now being prepared, and it is proposed to issue it at intervals of about three months. The principal agricultural shows were again attended in all parts of the country, and the number of farmers who called for advice was large.

The Committee decided to take part in the British Empire Exhibition at Wembley, and a fine position on the main gangway of the Palace of Industry was secured. In spite of the unseasonable time of the year at which the exhibition was held from a sulphate of ammonia point of view, it was possible to arrange a striking display whose attractiveness was considerably enhanced by the three pictures conceived and executed by Mr. Malcolm Milne. The number and varied character of the inquiries received daily was astonishing, but it is not possible to point to any immediate increase in sales as a result of the Exhibition.

We have continued to support the admirable work carried out at Rothamsted in the same manner as before, and those of our members who were able to take advantage of the invitation to visit the experimental fields and laboratories this summer were able to convince themselves of the extraordinary value of the work being done.

Propaganda on the usual lines has been continued in Spain and the Canary Islands, and a satisfactory increase in consumption has taken place in those countries. The progress in Portugal has been slower, owing to the difficult financial conditions prevailing. The work in Italy has been in full swing for just over a year. A good beginning has been made; and in view of the increase in the Italian synthetic production which is about to take place, it is more than ever necessary that vigorous propaganda work should be carried on in that country. Egypt was visited by the General Manager in February; and while progress has undoubtedly been made in introducing sulphate of ammonia to cultivators, the Committee regret to have to record that the commercial arrangements appear to leave something to be desired. Representations have been made to our agents, and it is hoped these will have the desired effect.

As foreshadowed in our last report, work was started in India under the personal supervision of the General Manager in December last. It would require a whole administration to carry on propaganda work thoroughly in India, so vast is the territory; and it has therefore been decided in the meantime to concentrate our activities on the so-called commercial crops which are likely to show the best returns for the application of nitrogen in the shortest time, and which provide the native cultivator with the necessary inducement to apply nitrogen. The General Manager felt that it would be useless to endeavour to do propaganda work in India with a European organization, and he was fortunate enough to find in Mr. A. B. Modak, of Bombay, an Indian thoroughly conversant not only with the particular problem of Western India, but also with the nature and difficulties of the nitrogen problem. The work which has been started under his supervision will take long to mature, and the Committee do not expect definite results for at least two or three years. In the meantime all agricultural authorities interviewed in India agree that the application of sulphate of ammonia is becoming absolutely necessary if good crops of sugar and cotton are to be regularly obtained.

As a result of a brief visit by the General Manager to Palestine, arrangements have been made for experiments in that wheat-growing country. Propaganda work has also been started in China, under the supervision of Messrs. Brunner, Mond, and Co. (China), Ltd. Here, as in India, the possibilities are almost infinite, but our plan is to concentrate on a few crops in definitely defined districts at the commencement of our work.

MEMBERSHIP.

The Federation numbered on June 1, 1924, 421 members (an increase of 22 over 1922-23), whose annual production represents about 90 p.ct. of the total annual output in Great Britain and Ireland on the basis of the production for the calendar year 1923. The Federation also now represent a very large proportion of the output in Canada, India, and South Africa.

We are pleased to report that we are constantly obtaining applications for membership from undertakings about to commence the manufacture of sulphate of ammonia, and one or two non-members who were reluctant to join before have decided to throw in their lot with us during the year. But the largest share of the increase in membership is due to the fact that practically all the producers in India have decided to join the Federation. Their capacity is about 20,000 tons per annum, and the sale of this production will provide the Federation with supplies ready to hand with which to carry out the propaganda work in India, and at the same time eliminate a competitor from the Java market. Some little difficulty has been experienced in marketing the Indian production, owing to the fact that it is not yet of neutral quality, but we are pleased to be able to report that a majority of the Indian members have now decided to neutralize their sulphate.

We have appointed Messrs. Shaw, Wallace, and Co., of Calcutta, our sole selling agents for India, Burma, and Ceylon; and they will generally supervise our propaganda work, and assist us in carrying-out our duties towards the members of the Federation in India. India will form our tenth electoral district, and will at present have one representative on the Council.

The SECRETARY having read the notice convening the meeting, and the report of the Auditors,

CHAIRMAN'S ADDRESS.

The CHAIRMAN said: The salient features in the sulphate of ammonia market in the year under review have been a large increase in consumption and a considerable fall in price. At first sight, it may appear bad business from the maker's point of view to secure an 8 p.ct. increase in consumption at a cost of 10 p.ct. in the price. It was, no doubt, this consideration which prompted a critic some months ago, when comparing the methods of selling adopted by makers of nitrate of soda and sulphate of ammonia, to draw inferences unfavourable to the latter. The criticism implied that the method of maintaining prices selected by the nitrate makers might be applied with equal success by the sulphate makers. Let us examine this assumption. The nitrate makers have succeeded in keeping up the price of nitrate by reducing their production during the last four years by a quantity of about 2 million tons—a reduction of practically one year's production in four. This method is both justifiable and practicable where you have a natural deposit which does not waste away by being left in the earth; but it is clearly unjustifiable and impracticable where you have to deal with a bye-product of daily and, indeed, hourly production. It is also economically unjustifiable in, and therefore inapplicable to, the case of makers who produce their nitrogen synthetically.

TWO GROUPS OF NITROGEN PRODUCERS.

I have referred to this criticism because consideration of it helps to bring out the important and fundamental factors which govern the nitrogen market. You have two main groups of nitrogen producers. The first group is the nitrate group, an aggregate in Chile, bound naturally by the ties of homogeneous production and geographical propinquity, and artificially by membership of an Association representing nearly 100 p.ct. of the production. The second group, the sulphate group, is a dispersion throughout the countries of the world, consisting of units, heterogeneous in method and quality of output, disparate in aim by reason of national and individual jealousies, united only in the common determination to produce as much nitrogen as possible. As the total output of the second group exceeds the production of the first, it is clear that cataclysms in price can only be avoided if the elements in the second group can be subjected to a considerable measure of organization. Without such organization it is clearly impossible for any common policy to be adopted either as regards method of selling or propaganda.

There are in France, Belgium, Holland, Germany, Italy, Japan, and Australia organizations similar to this Federation. This fact has made it possible for these organizations and ourselves to endeavour to frame a policy which has for its chief objects the establishment and maintenance of a reasonable price calculated to induce consumption on the largest scale, and also the combining of propaganda effort. During the last eighteen months or so there has been an increase in consumption of nearly 200,000 tons of sulphate of ammonia on a total world production of roughly 2½ million tons; and this increase has been secured at a comparatively small sacrifice in price. These facts show, I think, that the existing organizations, including your Federation, have achieved a considerable amount of success.

INDIAN MAKERS JOIN FEDERATION.

We ourselves have received practical recognition of the value of organized effort not only by an increase in our membership at home, but also by the adherence of producers in South Africa, and of makers representing practically the whole of the output of sulphate of ammonia in India. We can, therefore, justly claim that there has been a satisfactory and steady increase in the membership of the Federation ever since its formation. I believe that if our efforts are supported by all British makers of sulphate of ammonia, and if the similar organizations in other countries to which I have referred succeed in maintaining and extending their membership, then the makers of sulphate of ammonia the world over should have no difficulty in finding outlet for all the nitrogen which they can produce at a reasonable level of price. In our reports we have given our reasons for thinking that a very large increase in the world's consumption of nitrogen is likely to take place within a comparatively short time. The great step towards an improvement in international relationships which has been taken as a result of the London Conference and the putting into practice of the Dawes Report should certainly stimulate the desire for a higher standard of living, which can only be satisfied by the use of more nitrogen.

AN APPEAL TO NON-MEMBERS.

Nevertheless, it is clear that ever-increasing efforts will have to be made by the Federation and kindred bodies in the field of propaganda, if consumption is to be increased sufficiently rapidly to absorb the large fresh supplies of nitrogen which will be available shortly both here and abroad. For this reason, we propose to ask you today to sanction a substantial increase in our propaganda expenditure. The foreign organizations to which I have referred are also increasing their propaganda activities; and therefore I would like to make a special appeal to non-members whose total production amounts to less than 10 p.ct. of the output in this country to join the Federation, and to makers in other countries who have held aloof from the central organization in their country, to join that organization. By doing so they will make it possible for these organizations and ourselves to carry through a reasonable and logical programme, beneficial alike to consumer and producer. By refusing to do so, and by continuing to sell where and when they like, they introduce into the nitrogen market an element of instability and uncertainty. The least harmful result of this individualism, when the quantities are small, is loss to themselves. But when the quantities are considerable, their operations produce chaos in the market, inflict loss alike on distributing and producing organizations, and actually tend to reduce consumption by inducing farmers to postpone their orders until too late, in the hope of obtaining an advantage in price.

INCREASED HOME DEMAND.

You will see from the report that the consumption in Great Britain and Ireland was further increased last season. That I think shows that farmers appreciated that our prices were favourable. We have been criticized in the Press because, during a period of the year under review, our home price was higher than our export price. The report shows that our average export prices have yielded us a better result than the average home prices. Experience has taught us that we can only hope to secure a maximum home consumption by arranging a reasonably low price for British farmers, and maintaining

that price through a sliding-scale which gradually rises in the winter and spring. This arrangement enables the agricultural merchant to make provision in good time for the requirements of his customers without fear of loss, and it also tends to prevent farmers from waiting until too late before placing their orders. Seeing, however, that buying for home agricultural purposes goes on throughout the year, it is necessary to fix the lowest price of the scale nearly a year in advance. It is inevitable in these times of erratic foreign exchange and variable incidence of supply and demand, that there should be months in which the home price, rising according to scale, becomes temporarily higher than the export price. I can assure you, however, that our policy in regard to the home market remains unchanged. We have always, in the past, given British farmers specially favourable terms; and we propose to continue to do so in the future.

REDUCTION IN HOME PRICES.

I mentioned that last year, as in previous years, we obtained a better financial result from our export trade than from our home trade. Our home price was in fact nearly 40s. per ton—over 11 p.ct. —lower than our price for the previous year. The cost of a unit of nitrogen was lower in the home price for sulphate of ammonia than in any other nitrogenous fertilizer. This fact, coupled with the special efforts which we have made to increase the efficiency of our propaganda work at home, no doubt explains why the home demand for sulphate of ammonia has increased, whereas there has been a falling off in the deliveries of nitrate of soda and other nitrogenous fertilizers.

INCREASE IN PRODUCTION AND EXPORTS.

You will observe that British production of sulphate of ammonia increased last year by about 18 p.ct. The production is now rather larger than it was in 1913; and we may look forward to a further increase in the future both from synthetic sources of production and also from bye-product ovens. The deliveries which we have received from Synthetic Ammonia and Nitrates, Ltd., of Billingham, have been regular and satisfactory in quality, and the problem of the synthetic production of ammonia on a commercial scale may be regarded as definitely solved as far as they are concerned. While the home market has absorbed a small portion of this increased production, I am pleased to be able to record a large expansion in our export trade. The tonnage exported during the year was larger by 37 p.ct. than the total for 1922-23, and Japan absorbed the bulk of the increase. The great increase in the demand for nitrogen in Japan during the past ten years is of good augury for similar developments in other Far-Eastern countries. For this reason we have begun to devote special attention to propaganda work both in China and India. While we cannot hope for immediate results in those countries, we are convinced that within a few years they will require to use very large quantities of nitrogen.

In Japan I am afraid we must look for a temporary set-back, owing to financial difficulties caused by the losses inflicted by the great earthquake of 1923.

IMPROVED QUALITY.

The report shows that we have continued to devote attention to the question of quality. Well over 80 p.ct. of the total British production is now of neutral quality; and I think I am correct in saying that all large makers in the country are either actually producing an acid-free salt, or have ordered the necessary plant to enable them to do so. This is a great improvement on conditions obtaining in the sulphate of ammonia market a few years ago. Experience is showing us, however, that further improvement in quality is possible; and our members are now making special efforts to increase the size of the crystals in their salt and to take steps to prevent risk of caking.

ACID PRICES LOWER.

I devoted a considerable portion of my remarks last year to the question of the price of sulphuric acid. I think we may say of that question, *solvitur ambulando*. There has been a substantial reduction in prices in some districts; and reports are reaching us from various parts of the country to the effect that our members have been able to secure supplies at lower prices. While we still consider that the price of acid is much too high, we expect that the law of supply and demand will eventually give us relief.

LOW COST OF ADMINISTRATION.

You will see from the report that the combined charge for administration and propaganda last year was 3s. per ton produced. This is the total cost of the Federation to its members; and we believe that you are getting a satisfactory return on this investment. At any rate, it is our constant endeavour that you should. In conclusion, I think we may claim that the result of last year's working has not been unsatisfactory to members of the Federation, when all the circumstances are taken into account; and I feel sure you will agree that results would have been very much worse if the Federation had not existed..

On the motion of the CHAIRMAN, seconded by Mr. A. READ (Bolckow Vaughan & Co., Ltd.), the report and accounts were adopted unanimously.

The Auditors (Thomson M'Lintock & Co.) having been re-appointed on the motion of Mr. R. HOLLIDAY (Ackton Hall Colliery Company), seconded by Captain A. INSTONE (Messrs. S. Instone & Co., Ltd.), the CHAIRMAN said he regretted to have to announce the resignation of Mr. A. K. M'Cosh, Vice-Chairman, owing to pressure of other work. He paid an eloquent tribute to the services which Mr. M'Cosh had rendered to the Federation.

On the motion of Mr. A. READ, seconded by Mr. A. STANLEY (Simon-Carves, Ltd.), the meeting then re-elected Mr. D. Milne Watson (Gas Light and Coke Company) Chairman, and Mr. E. J. George (Consett Iron Company, Ltd.) Vice-Chairman, and appointed Mr. S. Henshaw (Staffordshire Chemical Company (1917), Ltd.) to the vacant post of Vice-Chairman for the ensuing year.

The CHAIRMAN moved, and Mr. J. G. NICHOLSON (Brunner Mond & Co., Ltd.) seconded, a cordial vote of thanks to Mr. Stanley and the other members of the Propaganda Sub-Committee and the staff.

Mr. STANLEY and the GENERAL MANAGER (Mr. F. C. O. Speyer) having returned thanks, the proceedings terminated with a vote of thanks to the Chairman.

GAS REGULATION ACT APPLICATIONS.

There has appeared in the "London Gazette" the following further notice regarding applications to the Board of Trade under the Gas Regulation Act.

Finedon Gas Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 3d. per therm.

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Brierley Hill District Gas Lighting Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (Nov. 18.)

Hindley Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm.

After the declared date, "750 therms" shall be substituted for "150,000 c.ft." in section 2 (power to grant rebate on payments for plied by the undertakers be 16d. per therm. (Nov. 18.)
gas) of the Hindley Local Board Act, 1872.

The minimum permissible pressure at which gas shall be supplied by the undertakers shall be such as in any main or in any pipe laid between the main and the meter having an internal diameter of 2 in. and upwards to balance a column of water 2 in. in height. Provided that:

(i) The minimum permissible pressure shall, between the hours of midnight and 4 a.m., be such as to balance a column of water 16-10ths of an inch in height.

(ii) The Board of Trade may at any time, if they think fit, by Order in writing prescribe a higher minimum pressure than the said pressure of 16-10ths of an inch, not exceeding 2 in. of water, in respect of such periods and areas within the limits of supply as may be defined by the Order. (Nov. 15.)

Portland Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm. (Nov. 15.)

BRITISH INDUSTRIES FAIR.

Both Sections to be Combined at Birmingham Next Year.

An important development in the British Industries Fair for 1925 is announced to-day by the Department of Overseas Trade and the Birmingham Chamber of Commerce.

Owing to the proposed re-opening of the British Empire Exhibition, the Department of Overseas Trade have decided to suspend the London Section of the Fair until 1926, as a temporary measure for 1925 only. Arrangements have consequently been made by the Birmingham Chamber of Commerce to organize sections in their Fair for industries which have hitherto exhibited, and would ordinarily exhibit, in London, provided adequate support is secured.

This departure, it is considered, will have a number of advantages for manufacturers and trade buyers alike, especially for visitors from overseas whose time at that season is limited. Many branches of industry are so closely allied that, however carefully the sectional groups were arranged, buyers often found it necessary to duplicate their visits. Also, as it now seems certain that the British Empire Exhibition is to be continued next year, the holding of the combined Fair in the Midland industrial capital will emphasize the distinction between the two events—one being a public display of Empire activities, and the other, open only to trade representatives, solely a commercial buying centre.

The British Industries Fair at Birmingham will be held from Feb. 16 to 27; those dates having been chosen as most suitable by means of a referendum to the exhibitors themselves. The Birmingham authorities are fortunate in having ample accommodation at Castle Bromwich; and arrangements have been made to place a large additional building at the disposal of exhibitors. The best omen of all, however, is to be found in the deep impression made upon industry by the Guildhall speech of the Prime Minister. The feeling of confidence and security of which Mr. Baldwin made such a strong point has already had a powerfully stimulating effect in manufacturing and commercial circles whose interests are represented by the exhibitors and buyers taking part in the Fair.

Applications for space should be made at once to the General Manager, British Industries Fair (both sections), The Chamber of Commerce, No. 95, New Street, Birmingham.

The gross profit of the Thornton-le-Fylde Gas-Works for last year was £4315, compared with £3997 for 1922-23. The net profit was £1996, as against £1793.

WAR-BLINDED MASSEURS' WONDERFUL WORK.

We are asked by St. Dunstan's to publish the following, and have pleasure in doing so:

The important place which massage and medical electricity holds in modern curative treatments will be generally known, but probably many do not know that perhaps the most highly-trained and skilful practitioners of this valuable remedial art are to be found among the officers and men who were blinded in the war. Thoroughly trained and provided by St. Dunstan's with the very latest equipment for the practice of their profession, everyone of these war-blinded masseurs has passed the severe examination admitting them to membership of the Chartered Society of Massage and Medical Gymnastics.

It may be fairly claimed that these men have done a wonderful thing in fitting themselves for the efficient practice of such a profession. Their capacity for this work is testified to by some of the greatest medical authorities. For example, Major-General Sir Robert Jones, the famous orthopædist, says: "The work which the blinded masseurs of St. Dunstan's do is very exceptional in quality. They are in every sense of the term a great success. Apart from their qualities as masseurs, I think they have an extraordinarily good psychological effect upon their patients."

In view of the necessity of massage and its allied treatments being carried out only by properly qualified and trained experts, the St. Dunstan's Massage Clinic, established at No. 18, Christopher Street, Finsbury, has now been removed to a more central position for the treatment of patients, at Nos. 23-24, Wormwood Street, Old Broad Street, E.C. New and more up-to-date apparatus has been installed. The telephone number is London Wall 8886.

SMOKE.

Its Cause, Nature, Effects, and Methods of Prevention.

This was the title of a Chadwick Lecture delivered at the Royal Institute of British Architects last Wednesday by Prof. J. B. Cohen, Ph.D., B.Sc., F.R.S., of Leeds University; and the following are a few extracts from the lecture.

According to Prof. Foster the average individual inhales 2600 gallons of air in 24 hours, or about 34 lbs. by weight, as against 5½ lbs. of food. The lungs are more delicate in structure and function than the digestive organs; and we cannot with impunity inhale a vitiated air without permanent injury to our breathing apparatus.

Soot from factory chimneys is very different in character from that from domestic fireplaces. In the former case, owing to the high temperature and strong draught, the volatile portions of the coal are mainly consumed, while the draught carries off mechanically fine mineral dust and grit mixed with carbon containing little tar. Domestic soot, on the other hand, may contain as much as a quarter of its weight of tar. It is this tar which causes the soot to cling, accumulating with time and blackening every surface it touches with a varnish which is not removed by rain.

Vegetation suffers in several ways from the presence of smoke, for the normal growth of plants depends on light falling on the green surface of the leaf. If the light is partially cut off by the pall of smoke, or if the leaf (more especially of evergreens) is blackened by a coating of soot, or again if the stomata (the fine perforations in the leaf whereby transpiration of the plant is carried on) are blocked with tar, the plant suffers and dies. Again, the plant is affected by the acid soot and also by the sulphur acids which pass into the air from burning coal, and are washed down by rain. The effect of this acid is to corrode the leaf, which withers and falls much earlier in and near a town than in the country. Moreover, the acid, percolating through the soil, destroys certain organisms and enzymes concerned in the assimilation of the soil constituents. Many grasses, vegetables, and flowering plants succumb. Even the colour of flowers is affected.

The observations of Sir Frank Baines have made it only too evident that these sulphur acids from coal (and there is no other source than coal) attack masonry. Historic and beautiful buildings all over the country are undergoing slow but certain destruction. Fabrics, leather bindings, and metalwork are being similarly attacked. What is the remedy? So far as factory smoke is concerned the Public Health Act of 1875 gives powers to the local authorities to stop unnecessary smoke; and ample evidence was forthcoming before the Committee on Smoke Abatement that boiler chimneys need not smoke. A strict enforcement of these powers would stop the great bulk of factory smoke. It is difficult to legislate for the domestic fireplace. Gas and electricity are coming more and more into prominence for cooking and heating, and this is a good sign.

A good deal more might be done by the gas undertakings to promote the consumption of their coke. They have their show places for gas cookers and fires. Why not other showrooms for coke stoves (of which there are many on the market), where they could be seen at work and where the cost of installation and maintenance could be ascertained? Cheaper gas, cheaper coke, cheaper electricity, and an energetic local authority encouraging their sale while holding a firm hand on the offending boiler chimney, would clear the air of most of the smoke.

Piræus Power Station.—The Governor of the National Bank of Greece, M. Diomedes, has arranged with the Traction and Power Finance Company, Ltd., of London, for the formation of a strong combine which will erect a large up-to-date station near Piræus to supply electric power and light to Athens and its surroundings, which are insufficiently supplied at present. This combine will absorb the existing electric and gas companies, will electrify the Athens-Kifissia Railway, and will extend the tramways. A capital of £3,000,000 is required, of which £2,000,000 will be subscribed by the British concern and £1,000,000 by a syndicate of Greek banks and a Belgian group.

TRADE NOTES.

Gas Plant.

The Whessoe Foundry and Engineering Company, Ltd., of 106, Cannon Street, London, E.C. 4, have published a booklet, the purpose of which is to convey, in handy form of reference, an idea of the productions in which the firm specialize. It is not issued as a "catalogue" in the accepted sense, but comprises a small selection from a wide range of photographic subjects illustrating various works actually carried out by them. The Whessoe Foundry has an unbroken career dating back to 1790.

Cardiff Engineering Exhibition.

At the forthcoming exhibition to be held in the Cardiff Drill Hall, Messrs. Edward le Bas & Co., Ltd., of Dock House, Billiter Street, London, E.C. 3, will exhibit on Stand No. 8, No. 2 Hall. The firm have a full range of +GF+ malleable tube fittings which are now well known throughout the world. Every fitting bears a guarantee, and each is tested to at least 300 lbs. per sq. in. The threads are true to British standard, are perfect in alignment, and geometrically correct. The fittings, it is claimed, offer a considerable saving in cost over wrought-iron ones. One interesting display is a combination set of +GF+ fittings, comprising over a hundred, which have been tested to 3000 lbs. per sq. in. hydraulic pressure without a "weep." Other interesting exhibits include a nest of evaporator coils made from 1-in. solid-drawn steel tube, ½-in. solid-drawn steel close-wound coil showing accuracy and diameter of overlap, and a circular coil made from 1½-in. steel tube having a diameter of only 4¾ in. There is also a full range of wrought-iron tube, &c.

CONTRACTS OPEN.

Meters.

The Gas Department of the County Borough of Walsall are inviting tenders for the supply of meters. [See advertisement on p. 594.]

Cast-Iron Pipes.

The Borough of Middleton are inviting tenders for the supply of 1320 yards of turned and bored cast-iron socket and spigot gas pipes. [See advertisement on p. 595.]

EXTENSIONS.

The Oswaldtwistle Gas Committee have resolved that the consideration of schemes for extending the retort house, &c., be adjourned *sine die*.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 24.

In the London market pitch undoubtedly continues steady and firm at a price not below 50s. per ton at makers' works. There is also more demand for creosote, and the price is firm at about 6½d. per gallon net and naked at makers' works. Solvent naphtha is slightly firmer at about 1s. 6d. per gallon for 95/160 quality. Pure toluole is about 1s. 9d. to 1s. 10d. per gallon; pure benzole about 1s. 7d. per gallon, and supplies are scarce.

Tar Products in the Provinces.

Nov. 24.

The market for tar products has been steady throughout the past week, and with most articles there is a distinctly better tone. In pitch, there has been a better tone, and there has been some inquiry again from the Continent, possibly because German pitch now appears to have been, for the time being, withdrawn from the market. Business is reported at 45s. to 47s. 6d. for prompt delivery and 50s. for January-March f.o.b. East Coast ports. As was expected there has been a renewal of demand from America for creosote now that the Presidential Election is settled, and probably 6½d. could be obtained to-day f.o.b., which, after deduction of storage charges and carriage and tank hire, is equal to about 5⅝d. to 5¼d. at the distiller's works. Benzole appears to be decidedly scarce, and as much as 1s. 6d. per gallon is reported to have been offered for prompt delivery. Solvent naphtha maintains its improvement, and business has been reported at 1s. 4d. delivered to buyers' works in the North. Heavy naphtha is still neglected, and business is difficult to negotiate. Crude carbolic is quiet, in view of the very low prices which are being accepted on the Continent for crystals. Cresylic acid is quiet; there being only a very small demand from the States. Naphthalene remains depressed, as Continental makes are offering at equal to £13 delivered this side. Crude naphthalene is exceedingly dull, and it is almost impossible to sell this article. Anthracene is purely nominal, as the makers of alizarine appear to have ample stocks.

The average values for gas-works products during last week were: Gas-works coal tar, 31s. to 36s. Pitch, East Coast, 47s. 6d. to 50s. f.o.b. West Coast—Manchester, 44s. to 45s.; Liverpool, 45s. to 46s.; Clyde, 47s. 6d. to 48s. 6d. Benzole 90 p.ct., North, 1s. 4d. to 1s. 5d.; crude 65 p.ct. at 120° C., 9½d. to 10½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 4d. to 1s. 5d., nominal. Coal tar crude naphtha in bulk, North, 7d. to 7½d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 4d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 5½d. to 5¾d.; salty, 5¼d. to 5½d.; Scotland, 5¼d. to 5⅝d. Heavy oils, in bulk, North, 6⅝d. to 7d. Carbolic acid, 60 p.ct., 1s. 7d. to 1s. 8d. prompt. Naphthalene, £13 to £15; salts, £4 to £7, bags included. Anthracene, "A" quality, 3½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Without any improvement in prices, it was generally agreed that the market closed the week with a better tone. There has been a good deal of inquiry for the rest of this year, and it is hoped that this may lead to sufficient business to keep collieries fairly employed. For next year, sales still mature very slowly, but there are, perhaps, slight indications that would-be buyers' and sellers' ideas are getting nearer together. Collieries remain firm in their ideas that they cannot offer coal for next year at less than current prices, since those which have kept working fairly regularly through the bad times have mostly been enabled to do so only with the help of good contracts which expire at the end of the year.

An encouraging feature has again been the improvement in Durham smalls, for which quite a demand has sprung up, and a better tone (without, however, any advance in price) in unscreened coking makes. These have been the weakest spots for a long time, and any improvement is looked upon as a good sign for the Durham market as a whole.

Good gas coals have been steady, Wear specials quoting 22s. to 22s. 6d., and best qualities about 21s. Seconds and others remain at about 17s. 3d. to 18s., and are in abundant supply.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

There is an improvement in the situation so far as the Midlands are concerned. Surplus stocks of D.S. nuts have been reduced, and some of the collieries can get 2s. to 3s. a ton more than they were prepared to take to relieve the congestion a few weeks ago. The stocks of slacks have likewise been lightened. Large purchases by the electricity undertakings have been instrumental in bringing about a better position as regards smalls generally. Longer hours are being worked at most of the collieries. Gas-works are taking their contract supplies regularly. There is no appreciable acceleration. The inability of managements to take advantage of the cheap spot lots which are offered leaves collieries no alternative but to balance supply and demand by occasional curtailment of output. Less stringency prevails with reference to gas coke; but the high prices are maintained. Furnace cokes are plentiful, and this checks any tendency to push up quotations. With pig iron stocks down to a more reasonable level, the prospect of additional blast furnaces being put into commission again has been brought nearer. Smelters are nervous as to the possible effects of an increased production on coke prices, and show a certain amount of caution with regard to forward contracting. Some sales have been made over the first month or two next year, however. The weather has been less mild, though not severe enough to stimulate materially the demand for house coal. Values in this department show little change.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

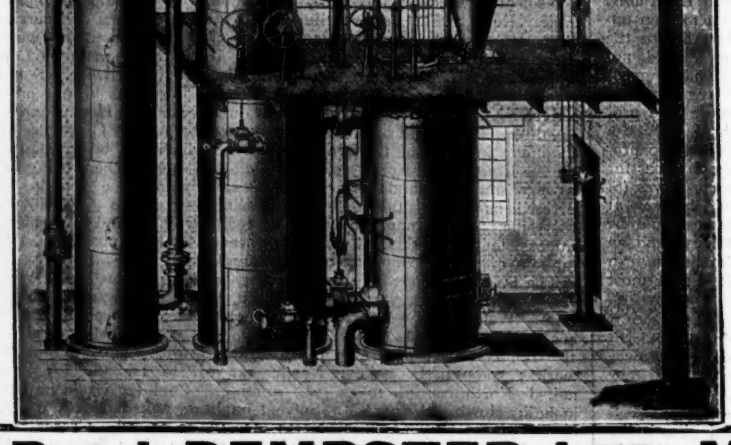
Gas coal consumers in Yorkshire and Lancashire are still finding it difficult to take advantage of non-contract coal supplies at lower prices than their contract figures. Probably this is due to the mildness of the weather for this time of the year.

There is no material alteration in the general market conditions since last week. Collieries are able to supply the requirements in respect of household fuel of every description. The industrial situation does not improve, and although there are signs of better trade in one or two areas, there is not as yet the increased volume of business which was anticipated. Prices for the commoner steam-raising fuels, therefore, continue low, although for forward business producers are quoting figures in excess of the cut prices of to-day for outside contract fuel. Whether they will be successful in maintaining their position is problematical, and it may be that many consumers will continue to buy in the open market whatever limited supplies they require until the state of trade is more settled.

The export section continues to be remarkably dull, and very few inquiries are coming through for the Humber ports. South Yorkshire hards remain steady as compared with the fluctuations of the Tyne D.C.B. large. Furnace coke is in rather better request, possibly owing to the anticipated difficulty of stems near the Christmas holidays, and as yet there appears to be no reason for an increased f.o.b. price. Other qualities are still slightly on the decline, and gas coke especially is much freer than for some time past.

Prices at Hull at the week-end were: Yorkshire, Derby, and Notts large screened steam, f.o.b. Humber ports, 18s. 6d. to 20s. 6d.; best Yorkshire hards, Association, 22s. 8d. to 23s.; Derby best hards, 23s. 6d. to 24s. 6d.; West Yorks Hartleys, 19s. to 21s. 6d.; South Yorks washed doubles, 19s. 6d. to 20s. 6d.; South Yorks washed singles, 18s. 6d.; dry doubles, 15s. 6d. to 16s. 9d.; South Yorks washed smalls, 14s. to 14s. 6d.; Derby slack, 1 in., 10s.; South Yorks rough slack, 10s. 3d.; gas coke, 30s. to 35s.; foundry furnace coke, 21s. to 22s. 6d.; washed smithy peas, 22s. to 24s.; washed steam thirds, 16s. 6d.; South Yorks washed trebles, 21s. 6d. to 22s. 6d.

A total failure of the electric main power station occurred during the busiest shopping hours at Folkestone last Saturday night. Large business premises and hotels suffered considerable inconvenience.



Water Gas Plant.

OUR LATEST TYPE OF LIGHTLY CARBURETTED OR BLUE W.G.P. IS GIVING EVERY SATISFACTION.

WE MANUFACTURE AND ERECT THE WHOLE APPARATUS OURSELVES.

R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

"The Gondoliers" at East Greenwich.

The Metrogas Amateur Operatic Society opened their second season at the South Metropolitan Gas Company's Co-Partnership Institute, East Greenwich Gas-Works, on Wednesday last, with the production of the Gilbert and Sullivan opera "The Gondoliers." The production of an opera of this calibre by amateurs is no easy task; but it must be admitted that the Society (all the members of which are employees of the South Metropolitan Gas Company) have every reason to be proud of their achievement. Talent and energy were in abundance; and the rendering and staging left nothing to be desired. It is not surprising, therefore, that the members had the satisfaction of playing, on the opening and the three succeeding evenings, to large and appreciative audiences, who accorded the performers much applause. As usual, the music was provided by the Company's orchestra, ably conducted by Mr. Sydney Herbert.

London County Council Subway By-Laws.

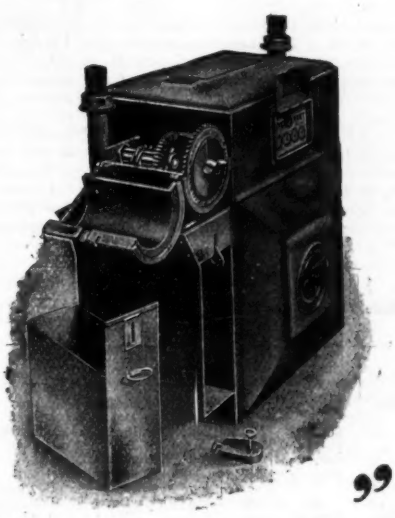
The Highways Committee have submitted to the London County Council a report providing for increased charges. They state that the by-laws under section 10 of the London County Council (Subways) Act, 1893, with respect to subways vested in the Council, which are at present in force, were made by the Council on Nov. 25, 1913, and were approved and allowed by the Board of Trade on Aug. 1, 1914. Under these by-laws certain charges are specified in respect of the use and supervision of subways. Having regard to the increased cost which has occurred since August, 1914, in connection with the daily inspection of the subways, and the supervision of the various users' works therein, they are of opinion that these charges should be increased by 50 p.ct. as far as concerns (1) the repair or alteration or the laying in, or removal from, any subway of a pipe or wire—present charge 5s. a day or part of a day; (2) the opening or closing of a subway at any time other than that fixed for the daily visit of the Council's officers—present charge 1s.; (3) the annual charges for the use of, and supervision of, works which may be laid, or additions to the space occupied by any pipe or wire beyond the limits of the same, in any subway after the date of approval of the increased charges. The authorized users of the subways, excepting the Postmaster-General, have been approached, and are generally either agreeable to the proposal or will not oppose it. The by-laws in question do not apply to electric lighting companies or local authorities having electric light powers, and the increased charges for the use of the subways by such companies and authorities have been agreed with those concerned. The Board of Trade have intimated that they have no observations to make on the draft by-laws submitted to them with a view to giving effect to the proposed increase of 50 p.ct.; but before giving their formal approval, they require that notice of the proposed alterations in the by-laws shall be given by public advertisement, and shall also be given to companies and authorities concerned. It is advisable that the Council should first make the new by-laws, a copy of which, when approved, will have to be submitted to the Postmaster-General under section 10 of the London County Council (Subways) Act, 1893.

New Perth Gasholder.—The Finance Committee of the Perth Town Council have received intimation that the Scottish Office have directed that the loan of £27,000, sanctioned to meet the cost of erection of a new holder at the Corporation Gas-Works, be spread over a period of fifteen years. A State unemployment grant is being made towards the cost.

Barrow Corporation Gas Accounts.—The "Blue Book" issued by the Borough Treasurer to the Barrow Corporation includes a report by the Gas Manager (Mr. Claude Diamond), which sets forth that the gas sold in the year to March 30 last (283,975,000 c.ft.) was an increase of 4,464,000 c.ft. on the preceding twelve months. The unaccounted-for gas, at 12·2 p.ct., showed a reduction of 0·2 p.ct. The gas made per ton of coal was 13,442 c.ft., as compared with 13,419 c.ft. Of 13,657 consumers, 10,146 were on the prepayment system.

Liskeard Gas Company.—The shareholders of the Liskeard Gas Company have accepted a recommendation from the Directors authorizing them to enter into negotiations with the Town Council with a view to the sale of the undertaking to the municipality, with the ultimate aim of developing electric lighting in the borough. At the shareholders' meeting, Mr. C. J. Ennor, one of the Directors, emphasized that the Board were not asking the shareholders for power to sell, but merely for authority to negotiate. A further meeting of shareholders would be called when the negotiations reached a certain point. In the event of the negotiations falling through, the meeting also took preliminary steps with a view to the conversion of the Company into one of limited liability, in order to raise additional capital more easily.

Compensation Claim at Hastings.—Samuel Upton, a man of 64 years of age, who had been employed by the Hastings and St. Leonard's Gas Company as a general labourer for 32 years, his wages being £2 10s. 6d. a week, made a claim against them under the Workmen's Compensation Act. According to his evidence, he became affected while at work last March on a purifier, where there was a leak, and had been ill from anæmia ever since. The medical evidence was of a very contradictory nature, but Judge Moore Cann said it seemed Upton was in a bad state of health on the date of the occurrence. Apparently one condition was that of his teeth, though there were a great many other things which might cause anæmia. Was the rapid acceleration due to gas poisoning? Of course, if a workman was in a certain condition of health which did not prevent him from working, and then suffered an accident which brought the latent seeds of disease into activity, he had a good claim. On the evidence, he decided that plaintiff was in such a state of ill-health, and that the fumes had so affected him, that the latent disease came into activity. There was no chance whatever for him to get back to work. He awarded the plaintiff 25s. 3d. per week from March last, with costs.



The "Victory"

PREPAYMENT METER

WITH

PLATE PRICE CHANGER.

OUTSIDE VALVE BOX.

EVERY PART INTERCHANGEABLE.

MADE BY

THE PIONEERS

OF THE SLOT METER,

SAWER & PURVES

(BRANCH OF METERS LIMITED),

MILES PLATTING, RADFORD ROAD,

MANCHESTER. NOTTINGHAM.

45-47, Westminster Bridge Rd.,

LONDON, S.E.

STOCK MARKET REPORT.

As was anticipated, the Stock Markets were quieter last week. The ramifications of the Settlement, however, kept members and their staffs fully occupied. The Government's Conversion scheme in respect of the 5¾ p.ct. Exchequer Bonds due on the 1st of February next, although generally approved, brought about a desire to sell for reinvestment on the part of holders who do not relish the fall of £1 5s. p.ct. in the return on their capital.

The gilt-edged stocks were affected by the influence of dearer money, but no marked weakness was shown. In the Foreign Market, French Government Loans strengthened, and the excellent dividend statement of the Peruvian Corporation attracted buyers to the Preference Stock. There were many rumours current with regard to the terms of the forthcoming Greek Loan. As at present advised, it will be for £10,000,000 at 7 p.ct. issued at £88 and realising just under 8 p.ct.

In the Industrial Market a decided pause was noticeable throughout the week, and, although prices generally were maintained, it is quite within the bounds of possibility that a downward tendency will develop. These remarks do not apply to the Gas Market, in which really remarkable advances were made during the week. The various stocks of the newly-quoted Uxbridge, Maidenhead, and Wycombe Gas Company (which will shortly be added to our Tables) rose sharply. The ordinary stock rose 9 points, to 102-107; the preference stock 2 points, to 92-97; and the 5 p.ct. (Maidenhead) stock 10 points, to 100-105. The improvement was doubtless brought about by the terms of the new issue of capital which the Company are making. It will be seen that the various Wandsworth stocks also showed substantial improvements. These increases are the more remarkable having regard to the approaching inquiry into the Company's standard price.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 4 p.ct. debenture 64½, Brentford "B" 116, British 7 p.ct. preference 128, Continental Union 7 p.ct. preference 92⅞, Croydon maximum dividend 86½, European 8⅜, 8½, Gas Light and Coke 95½, 95⅜, 95⅝, 96, 96¼, 3½ p.ct. maximum 62, 62½, 63½, 4 p.ct. preference 80, Hastings and St. Leonards 5 p.ct. 97½, Imperial Continental 177, 177½, 178¼, Montevideo 61, Primitiva 8s. 6⅜d., 8s. 7½d., 8s. 10¾d., 4 p.ct. (Buenos Ayres) debenture 62½, South Metropolitan 100¼, 100⅜, 101, South Suburban 5 p.ct. 107½, Tottenham "B" 102, Wandsworth "B" 115½, 116. Supplementary prices, Danish 5 p.ct. preference 5⅜, 4 p.ct. debenture 74½, 75, Gas Light and Coke 10 p.ct. bonds 194, Oxford 5 p.ct. debenture 99, Wandsworth 3½ p.ct. new 100.

On Tuesday, Aldershot "C" 82, Brentford "B" 116⅜, 117, 4 p.ct. debenture 76¾, Commercial 3½ p.ct. 95, Gas Light and Coke 95¼, 95½, 95⅜, 4 p.ct. preference 80½, 81, Montevideo 62, 62½, Oriental 100½, Primitiva 8s. 10½d., 4 p.ct. (Buenos Ayres) debenture 62, South Metropolitan 100¼, 3 p.ct. debenture 60⅜, 61¼, South Suburban 5 p.ct. 107⅝. Supplementary prices, Danish 58s. 9d., 60s., Guildford consolidated 104½, 105, Malta and Mediterranean 1st, 7 p.ct. preference 92s. 6d., Oxford 5 p.ct. debenture 99.

On Wednesday, Brentford "A" 115, "B" 116, British 117, 7 p.ct. preference 126½, Continental Union 39, 7 p.ct. preference 93, European 8½, Gas Light and Coke 95¼, 95⅜, 95⅝, 96, 3½ p.ct. maximum 62, 4 p.ct. preference 80½, Liverpool 7 p.ct. preference 102, Primitiva 8s. 6d., South Metropolitan 100½, 100¾, 101, Tuscan 8s., Wandsworth "B" 117. Supplementary prices, Rochester, Chatham, and Gillingham 8 p.ct. debenture 103½.

On Thursday, British 117, 7 p.ct. preference 126½, Continental Union 38½, Gas Light and Coke 95⅜, 96¼, 3½ p.ct. maximum 63½, Imperial Continental 173, 174½ *ex* div., Primitiva 8s. 6d., South Metropolitan 100½. Supplementary prices, Barnet District "D" Water 108, 108½, British Norwich 3½ p.ct. debenture 63, 64, Gas Light and Coke 10 p.ct. bonds 193, 194, Rochester, Chatham, and Gillingham 8 p.ct. debenture 104.

On Friday, British Gas Light 117, 7 p.ct. preference 126½, Continental Union 37½, Gas Light and Coke 95½, 96, 96⅛, 3½ p.ct. maximum 62½, 4 p.ct. preference 80½, 3 p.ct. debenture 63, Imperial Continental 173½ 174 *ex* div., Oriental 101, Primitiva 8s. 6d., 8s. 7½d., 8s. 9d., South Metropolitan 95½, 100, 100¼, 6½ p.ct. debenture 104½, 105, South Suburban 107½, 109, Tottenham District "B" 103. Supplementary prices, British Gas Light 3 p.ct. mortgage debenture 54, 54½, 3½ p.ct. mortgage debenture 64, Colombo 11⅝, 7 p.ct. preference 9⅞, Sutton 109½.

Generally money was dear throughout the week, but on Friday rates were a little easier. Old day-to-day loans were renewed at from 2½ to 3 p.ct., but 3½ p.ct. was obtained for overnight accommodation. The discount market was quiet, and Treasury Bills were sold at a slightly lower average rate—£3 13s. 9.35d. p.ct.—than the previous week.

Although the Foreign Exchanges were rather erratic, the closing prices showed little change. Sterling on New York closed at 4.63 7/16 compared with the previous week's rate of 4.63 9/16. French francs were 87.80. Belgian francs 95.75, Italian lire 106.75, and German renten marks 19.46½.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5, 1923. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 21.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 14	5	5	Aldershot 5 p.c. max. C.	80—83	..	
235,492	"	"	4	4	Do. 4 p.c. Pref.	72—77	..	82
1,551,868	"	Sept. 25	6	6½	Alliance & Dublin Ord.	62—67	..	..
374,000	"	July 10	4	4	Do. 4 p.c. Deb.	63—68	..	..
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5½	..	64½
100,000	10	Aug. 14	8½	8½	Bournemouth 5 p.c.	13½—13¾	..	..
583,110	10	"	7	7	Do. B 7 p.c.	12¾—13	..	..
150,000	10	"	6	6	Do. Pref. 6 p.c.	10¾—11⅛	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb.	57—60	..	..
162,025	"	"	4	4	Do. 4 p.c. Deb.	77—80	..	..
992,045	"	July 10	6 10/16	6 10/16	Brentford A Con.	113—118	+1	115
990,500	"	"	6½	6½	Do. B New	113—118	+1	116—117
76,000	"	"	5	5	Do. 5 p.c. Pref.	87—92	..	..
306,690	"	June 12	4	4	Do. 4 p.c. Deb.	75—80	..	79½
181,337	"	"	—	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	"	Aug. 28	11½	11½	Brighton & Hove Orig.	170—175	..	..
244,200	"	"	8¾	8¾	Do. A Ord.	125—128	..	..
1,287,500	"	July 24	5	5	Bristol 5 p.c. max.	92—93*a*	..	..
855,000	"	Sept. 25	7	8	British Ord.	115—120	..	..
100,000	"	June 26	7	7	Do. 7 p.c. Pref.	125—130	..	117
120,000	"	"	4	4	Do. 4 p.c. Red. Deb.	72—77	..	126½—128
100,000	10	May 22	6	8	Cape Town, Ltd.	7—8	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb.	72—77	..	..
626,860	"	July 24	6	6	Cardiff Con. Ord.	97—100	..	..
237,860	"	June 26	7½	7½	Do. 7½ p.c. Red. Deb.	103—106	..	..
157,150	"	Aug. 14	6½	5	Chester 5 p.c. Ord.	86—91*b*	..	..
1,513,280	"	July 24	6	6	Commercial 4 p.c. Cap.	93—96	..	..
560,000	"	"	6	6	Do. 3½ p.c. Cap.	93—96	..	..
475,000	"	June 12	3	3	Do. 3 p.c. Deb.	56—59	..	95
800,000	"	14 Jan. 15	—	—	Continental Union, Ltd.	37—42	..	..
200,000	"	June 12	7	7	Do. 7 p.c. Pref.	89—94	..	37½—39
660,000	"	Aug. 28	6½	6½	Croydon sliding scale	101—104	..	92½—93
284,975	"	"	5	5	Do. max. div.	84—87	..	..
492,270	"	Aug. 28	0	6	Derby Con.	107—110*c*	..	86½
55,000	"	July 10	4	4	Do. Deb.	74—76*c*	..	..
209,000	"	Oct. 9	5	5	East Hull 5 p.c. max.	—	..	..
1,002,180	10	July 24	2	6	European, Ltd.	8—9	−½	..
16,503,045	Stk.	Aug. 14	5½	5½	Gas Light & Coke 4 p.c. Ord.	95—97	..	8¾—8¾
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	61—64	..	95¼—96½
4,062,235	"	"	4	4	Do. 4 p.c. Con. Pref.	78—81	..	62—63½
4,761,930	"	June 12	3	3	Do. 3 p.c. Con. Deb.	60—63	..	80—81
130,000	"	—	10	10	Do. 10 p.c. Bonds	..	..	63
42,000	"	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	193—194
82,500	"	Sept. 11	6½	6½	Hastings & St. L. 5 p.c. Conv.	95—100	..	..
258,740	"	"	5½	5½	Do. 3½ p.c. Conv.	75—80	..	97½
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16—17	..	..
86,600	Stk.	Aug. 4	10	10	Hornsey 7 p.c.	138—143	..	..
1,976,000	"	Nov. 20	30	10	Imperial Continental Cap.	171—176*	−4	173—174½*
263,950	"	Aug. 11	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	"	Aug. 11	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	..	..
2,127,340	"	Aug 14	5½	5½	Liverpool 5 p.c. Ord.	90—91*b*	..	..
600,000	"	Sept. 25	7	7	Do. 7 p.c. Red. Pref.	102—105*b*	..	102
165,736	"	Aug. 28	8	9	Maidstone 5 p.c. Cap.	120—125	..	..
63,480	"	June 26	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	"	5	7	Malta & Mediterranean	3½—3¾	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	58—63*	..	..
1,875,892	"	July 24	5½	5	Newcastle & Gateshead Con.	83¾—84½	+½	61—62½
250,166	"	"	4	4·	Do. 4 p.c. Pref.	74—75*d*	..	..
529,705	"	June 26	3½	3½	Do. 3½ p.c. Deb.	69—71*d*	..	..
15,000	10	Aug. 28	11	11	North Middlesex 10 p.c.	16—17	..	..
75,940	10	"	7 7/10	7 7/10	Do. 7 p.c.	11¼—11½	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	99—102	..	..
138,120	"	June 26	7 7/8	7½	Plym'th & Ston'house 5 p.c.	112—117	..	100½—101
60,000	50	Aug. 28	13	13	Portsea Island B	99—102	..	..
100,000	50	"	12	12	Do. C	95—100	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/0—9/0	..	8/6—8/10½
311,100	100	June 2	4	4	Do. 4 p.c. Red. Deb.	76—79	..	..
600,000	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	57—62	..	62—62½
220,335	"	June 26	4	4	Do. B. Aires 4 p.c. Rd. Db.	57—62	..	..
321,670	"	"	4	4	Do. R'r P'te 4 p.c. Rd. Db.	57—62	..	..
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref.	7¼—7¾	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—44	..	..
270,000	Stk.	Aug. 28	5/8/4	5½	Sheffield A	103—105*e*	..	..
419,968	"	"	5/8/4	5½	Do. B	103—105*e*	..	..
1,047,000	"	"	5/8/4	5½	Do. C	103—105*e*	..	..
90,000	10	Oct. 23	8	6	South African	7—9	..	..
6,609,895	Stk.	Aug. 14	6½	5	South Met. Ord.	99½—101½	+½	95½—100½
102,580	"	July 10	5	5	Do. Red Pref.	98—100	..	..
1,895,445	"	"	3	3	Do. 3 p.c. Deb.	60—63	..	60½—61½
734,000	"	Sept. 11	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	104½—105
91,500	"	Aug. 28	8½	8½	South Shields Con.	134—138*d*	..	..
1,087,795	"	Aug. 14	6½	6½	South Suburban Ord. 5 p.c.	104—109	..	107½—109
368,837	"	June 26	5	5	Do. 5 p.c. Deb.	93—98	..	..
647,740	"	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83—86	..	..
121,275	"	June 26	4	4	Do. 4 p.c. Deb.	73—78	..	..
250,000	"	Aug. 28	7	7	Swansea 7 p.c. Red. Pref.	102—104	..	..
200,000	"	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	104—106	..	..
120,000	"	July 24	8	8	Tottenham District A 5 p.c.	118—121	..	..
882,275	"	"	6½	6½	Do. B 3½ p.c.	100—103	..	102—103
181,255	"	June 12	4	4	Do. 4 p.c. Deb.	76—80	..	..
258,251	"	Aug. 28	7/14/4	5	Tynemouth Con. and New	84—86*d*	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	"	July 10	9½	9½	Wandsworth A 5 p.c.	140—145	+5	..
255,636	"	"	7½	7½	Do. B 3½ p.c.	120—125	+7	115½—117
108,075	"	"	6/7/9	6/9/6	Do. C	102—107	+6	..
240,865	"	"	6/7/9	6/9/6	New Ordinary	..	..	100
352,000	"	"	7½	7½	Wimbledon 5 p.c.	115—120	+5	..
98,000	"	"	7½	7½	Epsom 5 p.c.	122—127	+7	..
88,416	"	June 26	3	3	3 p.c. Deb.	55—60	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

Newry Gas Profits.—Mr. R. Clarke, Local Government Auditor, reporting on the affairs of the Newry Gas-Works, stated that there was a profit of £1718 on the working in the year to March 31 last. The Urban Council expressed satisfaction with the report, and intimated approval of the manner in which the works were managed and the gas supply maintained.

Sale of Burgess Hill Gas Shares.—At Brighton last week, Mr. Horton Ledger sold by auction 320 £5 7 p.ct. redeemable preference shares (contingent on the profits of any year) in the Burgess Hill and St. John's Common Gas Company. The shares are part of additional capital authorized, and will be redeemable at par on June 30, 1942. The prices realized were from £5 4s. to £5 6s. per share.

Tottenham Gas Company's Statutory Obligations Fulfilled.—The Gas Referees' report of the official testings during the past quarter of the gas supplied by the Tottenham District Light, Heat, and Power Company states that the Company fulfilled their statutory obligations in respect of the gas supplied throughout their district. The declared calorific value is 500 B.Th.U., and the average value for the quarter was 503·7 B.Th.U.

Matlock Gas Finances.—At a meeting of the Matlock Urban Council it was reported that the balance in hand on the gas undertaking was £1412, that the capital outlay on the works had been reduced from £30,000 to £18,341, and that the amount standing to the credit of the revenue account was £2360. The question of reducing the price of gas was discussed, and it was decided that the matter be left over until the return for the last half-year was available.

The Swansea Gas Explosion.—After some confusion as to the form of verdict to be recorded, the Jury sitting on the adjourned inquest on the victims of the fatal gas explosion which took place six weeks ago in the cellar of a Swansea solicitor's office (see "JOURNAL" for Oct. 15, p. 183) returned a verdict that "Deceased died from injuries caused by an explosion of coal gas escaping from a defective decayed pipe." The Coroner (Mr. J. C. Morris) in summing-up, said they had no direct evidence, but it seemed that the gas pipe must have been fractured by the operation of throwing down the coal. How the gas became ignited, there was no evidence to show. It appeared to him, however, that the gas worked up through the floor. There was a fire in the room just above the cellar, and this was possibly the cause of ignition.

A Damaged Road.—The Durham County Surveyor reports that extensive damage has been done to the newly constructed sett paving and concrete foundations in Market Lane, Swalwell, by the bursting of the Newcastle and Gateshead Water Company's 30-in. main and a consequent explosion in connection with the gas main. It was due to the strength of the reinforced concrete foundations that the adjoining property escaped injury. He has informed both the Water Company and the Gas Company that the County Council hold them severally and jointly responsible for the cost of the necessary repairs—about £770. The Gas Company contend that they are not liable, as the fracture of their main was due to the bursting of the water main. The Water Company say that the bursting of their main was purely accidental, and that they are not responsible.

Price of Gas at Trowbridge.—The Trowbridge Urban District Council have received a letter from the Secretary to the British Gas Light Company, Ltd., relative to the Council's communication to them on the charges for gas supplied in the district, and stating that they regret they are unable at the present time to make any reduction. The Company assured the Council that they will further consider the matter when the accounts for the half-year to December next are under review.

Wandsworth Gas Company's Capital Issue Over-Subscribed.—The tenders for the £280,000 of new capital for the Wandsworth, Wimbledon, and Epsom District Gas Company which Messrs. A. & W. Richards offered on behalf of the Directors were opened on Thursday. The total amount of stock applied for was £460,000, and the tenders were as follows: For the new ordinary stock, £110 down to the minimum of £102; the average price of allotment being £103 19s. 4d. For the preference stock, par down to the minimum of £94; the average price of allotment being £95 19s. 7d. For the debentures, £84 down to the minimum of £79; the average price of allotment being £79 9s. 6d. p.ct.

Alderman Sir Joseph Calvert (Chairman of the Gas Committee) told the Middlesbrough Corporation recently that the terms arranged with Messrs. Dorman, Long & Co. for a further supply of coke-oven gas were better than previously, and for the next six years, at any rate, they would have this gas at no higher price than hitherto.

At the monthly meeting of the Accrington Trades Council and Labour Party, on Nov. 20, the question of the introduction of free cookers for dwelling-houses was discussed, and the Accrington and District Gas Board were asked to consider the advisability of installing free heating and cooking appliances, to encourage the greater use of gas.

The ownership of the Unbreakable Pulley and Millgearing Company, Ltd., of West Gorton, Manchester, has recently changed. The new proprietors have appointed Mr. C. A. Ablett, M.Inst.C.E., as Managing Director. Mr. Ablett is also Managing Director of the Cooper Roller Bearings Company, of King's Lynn.

At the inauguration of electric lighting at Knaresborough, on the 19th inst., from current supplied by the Harrogate Corporation, there was at the Town Hall an exhibition of both gas end electrical appliances, so that the public might take their choice of the two forms of lighting, heating, and power. Knaresborough has had gas exactly a hundred years. Electricity projects were rejected in 1908 and 1913. The new scheme cost £7000 for installation, and is controlled by a Joint Gas and Electricity Committee.

Mr. H. Singleton, of the Huddersfield Gas-Works, lecturing at the Technical College Chemical Society recently on "Gas Manufacture," explained the different kinds of retorts and methods of charging and discharging. He dealt also with the various coal and coke handling plant to be found on gas-works, and went into detail as to the treatment of the gas and the recovery of bye-products. He concluded by exhibiting a table of the various products, and their amounts, obtainable from a hundred tons of coal.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS; Situations Wanted, Six Lines and under (about 36 words), 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER.
United Kingdom & Ireland	Advance Rate:	35/-	18/-	10/-
	Credit Rate:	40/-	21/-	11/6
Dominions & Colonies & U.S.A. Payable in Advance		35/-	—	—
Other Countries in the Postal Union. Payable in Advance		40/-	22/6	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Central 6055.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.

WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815, Oldham, and 2412 Hop, London.

Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

WE Specialize in Small-Gas-Works and Solicit Inquiries for COMPLETE WORKS EXTENSIONS, and RENEWALS.
Penney & Porter (Engineers), Ltd., LINCOLN.
Established 1855.
Telegrams: Porter, Lincoln. Telephones: 266 & 211.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
(*See p. 224 "Gas Salesman."*)

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

THE BRITISH GAS PURIFYING MATERIALS CO., LTD.,
99, LONDON ROAD, LEICESTER.

Solicit enquiries for:—
NATURAL BRITISH PURIFYING MATERIAL,
NATURAL HYDRATED OXIDE OF IRON,
BEST QUALITY DUTCH BOG ORE,
BEST QUALITY BELGIAN BOG ORE,
"PREPARED" AND "UNPREPARED"
ARTIFICIAL OXIDES.

Telegrams: "BRIFURMAT, LEICESTER." Telephone: LEICESTER 5096.

GEORGE WILSON GAS METERS, Ltd. for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS.
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER,"
and at 268, Stockport Road, MANCHESTER.
Telephone: RUSHOLME 976. Telegrams: "GASMETER,"
and 46 & 47, Auckland Street, LONDON, S.E. 11.
Telephone: HOP 647. Telegrams: "GASEOUS LAMB."

PATENTS and Trademarks. Inventors' Advice, Handbook and Cons. free. B. T. KING (Regd. Patent Agent, G.B., Canada and U.S.A.), 146A, QUEEN VICTORIA STREET, LONDON. 38 years' refs. 'Phone 682 Cent.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—ROYAL 1166.

VICTORIAN PURIFICATION OXIDE.

A NATURAL HYDRATED BRITISH OXIDE
SUPPLIED IN THREE GRADES,
"A," "B," & "C,"
READY FOR IMMEDIATE USE.

THE
CHEAPEST OXIDE FOR GAS-WORKS
IN MIDLANDS OR LONDON DISTRICT.
COMPETITIVE PRICES FOR OTHER AREAS.

Particulars and Price Delivered, from the Sole Selling Agent:
F. H. BROWN,
7, OAKHAM ROAD,
DUDLEY, WORCS.
Telephone 2118 DUDLEY.

WEIGHBRIDGES

FOR Motor Lorries and Railway Traffic can be seen erected at our works READY FOR DELIVERY. Inspection by your Engineer invited, and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.
CHARLES ROSS, LIMITED,
SHEFFIELD.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Oct. 8, p. 190.

J. E. C. LORD (Manchester), Ltd., Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, &c.

APPOINTMENTS, &c., VACANT.

WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, has the FIRST CALL ON YOUR CONSIDERATION.

No. 7483.

THE Position advertised under the above Number has now been filled, and applicants are THANKED for their Applications.

THE South Metropolitan Gas Company has a Vacancy for an ENGINEER with Wide Experience in the Design, Construction, Erection, and Repair of Gasholders, Retort and other Manufacturing Plant and Structures of the kind used in Gas Works and Coke Oven Recovery.
Applications, giving Age, full Particulars of Qualifications, Experience, Military Service, and Salary required, should be made in writing to the undersigned before Dec. 6, 1924.
By order,
FRANK DAY,
Secretary.
709, Old Kent Road,
London, S.E. 15.

UTTOXETER GAS-WORKS, LTD.

APPLICATIONS are invited for the Position of MANAGER to the above Company from those Qualified to Take Charge of a Gas Undertaking with an output of 40 Million c.ft. per annum.
Applications, stating Age, Training, Experience, and present Occupation, with *copies* of not more than Three recent Testimonials.
Salary to commence, £260 per Annum, with House, Garden, Coal and Gas Free.
Letter of Application to be sent in by the 29th of November, addressed to the ENGINEER, GAS COMPANY, DERBY, Endorsed "Uttoxeter."

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

APPLICATIONS are invited from Qualified Gentlemen for the Position of ASSISTANT SALES MANAGER.
The successful Applicant will be required to have a sound knowledge of Gas Supply and Gas Appliances, to be a Good Salesman, and able to Adapt his Methods also to Water and Electricity; of Superior Education and Address, able to undertake own Correspondence (preference given to a Shorthand Writer and Typist) and a Good Advertiser and Propagandist with Initiative and originality.
Applications, stating Age, Salary required, and when Disengaged, accompanied by *copies* of three recent Testimonials should be addressed immediately to the SECRETARY, Victoria Road, ALDERSHOT.

WANTED.—Experienced Draughtsman for Engineering Works in North of England. One thoroughly conversant with all Classes of Coal Gas Plant and specially well up in Modern Gasholder Design and Construction.
Address No. 7485, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

THE Swansea Gas Light Company require the Services of several Fully Qualified GAS FITTERS, who are thoroughly Experienced in the Fixing of all Types of Gas Apparatus. Wages 1s. 6½d. per hour.
Apply, in writing, stating Qualifications and Experience, and enclosing *copies* of Testimonials, to the ENGINEER AND MANAGER, GAS WORKS, SWANSEA.

COUNTY BOROUGH OF DEWSBURY.
(GAS DEPARTMENT.)

TWO Trained Gas Fitters required for Gas Distribution and Maintenance Work.
Applications, stating Experience, Age, and Wages required, to the undersigned.
HENRY L. BATEMAN,
Engineer and Manager.
Gas Offices,
Savile Town,
Dewsbury.

WANTED — Thoroughly qualified GASFITTERS, large Undertaking in the Midlands. Current Wages, 1s. 6d. per hour (47 hour week). Permanency for suitable men. Send *copies* of recent Testimonials.
Apply No. 7486, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

WORKS Fitter wanted accustomed to maintenance of Machinery and Plant generally. Cottage available.
Apply with References, and stating Wages required, to The MANAGER, GAS COMPANY, SEAFORD, SUSSEX.

PLANT, &c., FOR SALE & WANTED.

GAS PLANT IN STOCK.

EXHAUSTERS. — Steam and Belt Driven, 4000 to 50,000 c.ft. capacity.
Purifiers.—Sets of 25 ft., 16 ft. by 12 ft., 10 ft. sq., and 10 ft. by 8 ft. Also Single Boxes 10 ft. sq.
Condensers.—Vertical C.I. Water Tube (½ million per day), 14 in. Connections. Also 6 in. and 8 in. Pipe Condensers.
Tower Scrubbers.—4½ by 36, 4½ by 18, 4 by 12.
Station Meters and Governors.—6 in. and 8 in. Connections, several nearly new.
Gasholder and Steel Tank.—10,000 capacity, with Cup for another Lift.
Tar Extractor.—Everett's Patent, 14 in. Connections.
Also in stock PUMPS, TANKS, VALVES, &c.
Bargain prices for erection complete.
Send us your inquiries.
Firth Blakeley, Sons, & Co., Ltd.,
CHURCH-FENTON, *via* LEEDS.

STEAM-BOILERS For Sale—All Sizes, Vertical, Loco-type, Cornish, Portable, and Other Types of Boilers.
Apply GRANTHAM BOILER & CRANE CO., LTD., GRANTHAM.

FOR SALE.—Station Meter by Parkinson & Co., 60,000 c.ft. per hour, in First-Class Condition, Dismantled ready for Re-Erection. Can be viewed by Appointment.
Apply, RESIDENT ENGINEER AND MANAGER, GAS-WORKS, MARINE PARADE, SOUTHAMPTON.

PHOTOMETRIC OUTFIT. — Pentane Lamp. Flicker Photometer (Simmance-Abady), patent and adjustable Slide and Gasometer. Inspection by appointment in London.
Address No. 7488, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

FOR SALE. — Kirkham Standard WASHER-SCRUBBER, capacity ½ million c.ft. per day, with 2-Way Valve and Engine, 12 inch connections. At the Gas-Works, Uxbridge.
Offers to the MANAGER.

FOR SALE—Large Rivetted Steel STORAGE TANK, 26 feet diameter, 22 feet high, capacity about 72,000 Gallons. Has been used for tar storage. Good Condition.
For particulars apply No. 7487, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

CONTRACTS OPEN.

COUNTY BOROUGH OF DEWSBURY.
(GAS DEPARTMENT.)

THE Corporation of Dewsbury invite TENDERS for the DEMOLITION of an Existing RETORT HOUSE; the Supply and Erection of a STEEL and BRICK RETORT HOUSE, COAL HANDLING PLANT, COAL STORAGE HOPPERS and CONVEYORS, RETORT CHARGING and DISCHARGING MACHINE, RETORT BENCH and FOUNDATIONS, HOT-COKE HANDLING MACHINE and COKE-QUENCHING BENCH, Gas driven ELECTRICAL GENERATING SETS, at the Gas-Works, Savile Town, Dewsbury.
Copies of the General Conditions, Specification, and Form of Tender may be obtained at the offices of the Gas Engineer and Manager, Mr. Henry L. Bateman, Gas-Works, Savile Town, Dewsbury, where plans of the proposed works may be inspected.
Tenders, endorsed "Tender for New Retorts and Coal and Coke Handling Plant," to be delivered to the undersigned not later than the 10th day of December, 1924.
The lowest or any Tender will not necessarily be accepted.
HOLLAND BOOTH,
Town Clerk.
Town Hall,
Dewsbury,
Nov. 15, 1924.

COUNTY BOROUGH OF WALSALL.
GAS METERS.

THE Gas Department of the above Borough are prepared to receive TENDERS for the supply of their requirements of GAS-METERS over the Twelve Months ending Dec. 31, 1925.
The approximate number of meters required over this period will be from 800 to 1000, and will consist mainly of No. 2 prepayment meters with side cash boxes.
Tenders to be lodged with the Town Clerk, Council House, Walsall, on or before Monday, the 15th December next, and to be endorsed "Gas Meters."
FRED DAVIES,
Engineer and Manager.
Gas-Works,
Pleck, Walsall,
Nov. 19, 1924.